02- SC 1006
Portfolio Sequence Number

APPENDIX T.1
Portfolio Class Profile Form

DIRECTIONS: Photocopy or download this form and fill it out completely. INCLUDE IT AS THE **COVER PAGE** (first page) of your portfolio.

1. Portfolio school and grade level: ☐ **ELEMENTARY** ☒ **MIDDLE SCHOOL**
☐ **HIGH SCHOOL** ☐ **SPECIAL EDUCATION FACILITY**

Grade level(s) in your portfolio class: pre-k k 1 2 3 4 5 (6) 7 8 9 10 11 12
(Circle all that apply)

2. Portfolio content area *(check appropriate boxes)*:

ELEMENTARY ☐

ENGLISH LANGUAGE ARTS ☐

MATHEMATICS ☐

MUSIC ☐ Choral ☐ Instrumental

PHYSICAL EDUCATION ☐

SCIENCE ☒ General ☐ Biology ☐ Chemistry ☐ Physics ☐ Earth

SOCIAL STUDIES ☐ World History ☐ U.S. History ☐ Geography
☐ Ancient Civilizations ☐ Other

SPECIAL EDUCATION ☐ Language Arts ☐ Mathematics

VISUAL ARTS ☐ Drawing/Painting ☐ Ceramics ☐ Photography
☐ Printmaking ☐ Sculpture

WORLD LANGUAGES ☐ French ☐ Spanish ☐ Italian ☐ Other

3. Portfolio Teaching Topic/Unit Title: Wonderful Earthworms

4. Number of minutes per class: 45

5. Total number of students in class: 22
# of boys 10 # of girls 12 # of ESL students 1 # of special education students ____

6. Primary texts used in portfolio class, if applicable. *(Please provide title, author/publisher, and date of publication of all textbooks)*

_____

_____

(Note: If elementary education teacher, please provide this information for both literacy and numeracy instruction)

7. Number of other adults in the room during portfolio instruction:

Indicate all that apply ☐ paraprofessional ☐ co-teacher ☐ parent volunteer ☐ other

APPENDIX T.2
Science Portfolio Unit Overview

Course General Science Grade level Sixth Grade

Unit's Essential Question:

Why are earthworms important? Knowing structure and function, what are the earthworm's needs and adaptations for their environment? How can earthworms be used to address the problem of excess waste in society?

Lesson Date	Lesson's Main Concept/s	Students' Main Learning Activities
31 January 2002	Identify students' knowledge, misconceptions, and questions they have about earthworms.	*Wondering about Worms,* KW Chart on what students' know and what they want to know about earthworms. Class discussion about chart.
1 February 2002	Facilitate comfort level with working with earthworms. Describe physical characteristics of earthworms. Discover behaviors of earthworms.	Students observe earthworms and complete: *Wonderful Worms Observation Sheet* *Worm Observation Lab*
4 February 2002	Review earthworm characteristics and behaviors. Explain worm internal anatomy	Large group discussion of Observation Lab View worm on transparency & Wilma Note taking on *Diagrams of Earthworm Anatomy* Homework is to create a poster illustrating all body systems in one worm
5 February 2002	Identify positive, negative, and interesting information about vermicomposting	Student Council Proposal Small group research using internet resources Recording information on sheet, Are *Earthworms the Solution?*
6 February 2002	Recommend Vermicomposting to be beneficial for the school food waste problem.	Student representative lead, class discussion, assessing whether vermicomposting could be a positive or negative solution for recycling food waste.

7 February 2002	Discover and explain best conditions for a healthy and productive worm bin.	Student participation in *Worm Experiment #1.* Do worms prefer damp or dry? Class discussion of results
8 February 2002	Discover and explain best conditions for a healthy and productive worm bin.	Student participation in *Worm Experiment #2.* Do worms prefer light or dark? Class discussion of results
11 February 2002	Discover and explain best conditions for a healthy and productive worm bin.	Student design and participate in *Worm Experiment #3.* Do worms prefer warm or cool temperatures? Class discussion of results Homework is to type formal lab report Research internet resources for more information about maintaining a vermicomposting bin. Record and discuss information on sheet, *Best Environment for Worm Bins*
12 February 2002	Identify materials for worm bin Synthesize the unit	Small groups make worm bins Homework is *Letter to the Student Council*
13 February 2002	Evaluate student learning	*Earthworm Quiz*

Introduction to the Portfolio Unit

My sixth grade students will participate in a hands-on inquiry unit in which they will explore three essential questions related to the topic of earthworms. The first question is, "Why are earthworms important?" The second question is, "Knowing structure and function, what are the earthworm's needs and adaptations for their environment?" The third question is, "How can earthworms be used to address the problem of excess waste in society?"

Students have previously learned about the animal kingdom and all of the phyla it encompasses. They know that earthworms belong to the animal kingdom because they are multicellular heterotrophs with specialized tissues and organs, whose cells lack cell walls. They understand that all animals have adaptations that help them survive in their environment. In the fall, they had a brief exposure to the three phyla of worms and can identify the characteristics that are unique to each phylum. They know that earthworms are members the phylum annelida because they have segmented bodies.

Students have learned about the phyla of the animal kingdom primarily through observations, mini experiments, projects and reflective and creative writing. They are familiar with discussing their ideas in class. They have not had a formal opportunity to participate in an experiment using the scientific method. The reason for this is that their science education in this district is not taken seriously until the sixth grade when it is taught as a core subject, not a special. I have spent the better half of this year helping the students learn to make simple observations, to learn from observation, to accurately read for information, and to think about cause and effect. I think the students are now prepared to take on the challenge of using those scientific processes and leaming the scientific method.

I chose to have the students explore earthworms for this unit because their inexperience with earthworms has led to a lack of appreciation of them. Unlike kids during my childhood, these students have not had the opportunity to touch, play, and observe the wonders of earthworms. They never had a chance to stop and think about what the world would be like without earthworms. The students know I love earthworms and are curious to find out why.

Another way I plan to keep my students engaged with this unit is to show them how earthworms are important to them, the school, and the community. I plan on doing this by making vermi-composting a student council issue. My students are very interested in helping the student council make our school a better and more important place. This class spends a lot of time finding new challenges for student council. With the aid of our class representative, vermi-composting will

be presented as an idea student council has for recycling food waste, but they need more information. My students will think that they are the "Chosen Ones" for the job!

To start this unit, I want the students to feel comfortable with handling and observing earthworms. This is important because I know many of them think earthworms are dirty, disgusting, and untouchable creatures. I will start off by modeling worm handling and showing them that the worms are harmless. I will give each pair of students a worm to observe. The students will learn from their observation and discussion. In pairs and with the class, we will discuss their observations. In order for the students to remember their observations, I will have them record their information on various lab sheets.

I set the classroom up in tables of four. This way they can discuss their ideas in small groups. During part of this unit the students will be researching, using Internet websites, to discover positive, negative, and interesting information about vermi-composting. They will also be reading for more information about how to make worm bins. Researching in groups of four will facilitate the process by allowing students to gather more information quickly. For many of the experiments, they will be working in groups of two. I tried to pair the students according to ability and achievement (one high and one low in each pair). This way students can guide, help, and learn from each other. Before and after all of the research and experiments, there will be whole class discussions about their learning. The discussions prior to each activity will help engage student learning. The whole class discussions after each activity will be to elaborate and extend student learning.

At the end of this unit, I anticipate my students will have a new view of earthworms. I not only expect them to discover the importance of earthworms, but also recognize that earthworms should be treated with respect as all other creatures in the animal kingdom.

Daily Log #1

Date: 31 January 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? Today, I wanted to introduce and motivate the students about the topic of earthworms. I wanted them to think back to September, when we studied the three phyla of worms. I wanted to know how much they remembered, and I also wanted to know if they knew anything else about the topic of earthworms. Additionally, I expected the students to generate questions they have about the topic. During the class discussion, I slowly focused the students on the essential questions for the unit on earthworms, which are: knowing structure and function, what are the earthworm's needs and adaptations for their environment? Why are earthworms important? How can earthworms be used to address the problem of excess food waste in society?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. To organize the students' thoughts, I gave them a worksheet about what they knew about worms and what they wanted to know about earthworms. I gave them ten minutes to think and write on this topic. While they were writing, I circulated around the room a few times and encouraged the students to write as much as they could.

After they finished writing, we had a class discussion about what they knew and wanted to know. I wrote their notes on the board and the students added information to their paper when it was appropriate. Because they were generating their own questions about worms, they felt they had ownership of the unit. I was able to focus many of their questions to fit one of the essential questions I have for this unit. For example, one student asked, "How do worms eat?" and another student inquired, "Can worms see?" After many of the senses of worms were inquired about, I let them know one of the goals for this unit was to understand how worms sense their environment and why their senses are important.

To conclude the class, I spent some time engaging the students with some interesting and fascinating facts about earthworms that would not be addressed in the unit. For example, I made a six-foot interactive earthworm for this unit and they wanted to know if some species of worms were capable of reaching that length. They were intrigued.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. When I was circling the room, I was glancing at students' notes. If I saw them writing something untrue about worms in the "know" column, I encouraged the class to only write facts they were absolutely sure of. I also told them if they weren't so sure of the fact, to write it in the form of a

question in the "want to know" column. I will look over their sheets to make sure I have caught all of their misconceptions. For example, a few of the students were not clear about what type of worms we are studying and were confusing their facts with flatworms and roundworms. I will be sure to make notes on their papers to reconsider their knowledge of earthworms.

Engaging the students in a discussion of what they knew and wanted to know about worms, helped me understand how much they already knew about the topic. This helps because I will not need to spend much time reviewing already known information. I was very surprised that the students were using vocabulary words from the start of the year. When this occurred, I asked for volunteers to explain the vocabulary word. By asking for a show of hands of who knew what each word meant, I was able to see how much the class knew.

Throughout the discussion, they seemed focused on the topic. Without asking or telling, they were writing the information I was writing on the board. They had a lot of questions, and they were eager to find out the answers.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today.

While I was asking about what they knew and wanted to know, I was very careful to call on as many students as I could. This was very important to me because I wanted the students to feel responsible for their learning. Although many of the questions they asked were already planned to be discovered in the unit, I still encouraged them to think of as many questions they could. I will remind them in future lessons that many of their questions will be investigated. Hopefully, this will keep their interest and build their learning.

My biggest problem with the activity was that it wasn't active enough. Because this class is at the end of the day, many of them are worn down after six classes. I need to make sure my lessons are little more interactive to keep attention. I think larger class discussions are harder for them to maintain interest than by working in smaller groups. Abbreviating this exercise could also be a good idea. I understand there will be a future need for class discussions, but I want to focus more time working in smaller groups, where each student might feel more encouraged to participate more often with more energy. I also need to work on making sure, regardless of the situation, calling students' attention as soon as they have drifted.

Student #3 1/31

Student #3

Wondering about Worms

Welcome to the wonderful world of earthworms! Before we start, I would like to know what you know about earthworms and what you would like to know about earthworms. Below, write your responses.

I know that worms....	I want to know... (Who? What? Where? Why? When? How?)
1. they bury themselves in the dirt	1. What do earthworms eat?
2. are good for your garden	2. Where are they found?
3. When cut in half they regenerate into 2 worms	3. Where are they not found?
4. are slimy and wiggle	4. Why do they help a garden?
5. Swerm around to move	5. How do they help a garden?
6. have a segmented body	6. What could kill a worm?
7. are heterotrophs	7. What are some parts of their body?
8. invertebrates	8. What is the scientific name of their phylum?
9. round bodies	9. How long do they live?
10. are multicellular	10. How do they digest their food?
11. belong to the animal kingdom	11. Do they hibernate?
12. Eat dead plant and animal matter	12. Can they survive in cold places?
	13. Could they swim?
	14. what do ~~you do~~ they give the soil?

Good Memory!!

Wow! You have a lot of questions! If we don't answer them all, please feel free to do some research on your own for extra credit!

Daily Log #2

Date: 1 February 2002, Lesson length Time: 45 minutes

What did you expect students to learn during the lesson? To start class I had students write about their observations of earthworms. This was important because many of my students have never touched a worm before. At first many of them were squeamish about touching the worms, but the slow introduction helped. I wanted them to view the worms with respect and realize there wasn't much to be squeamish about.

From today's lesson, I expected the students to learn about some behaviors, physical appearances, and senses of worms. Through observation I wanted the students to discover that their worms had a front end and a back end. They needed to be able to describe how they know this. I expected them to observe how earthworms move, and why worms tend to knot up when they meet. From observations they also needed to determine if their worm has eyes, ears, mouth, and a nose. This was an introduction to the essential question: Knowing structure and function, what are the earthworm's needs and adaptations for their environment?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. To prompt student interest, I welcomed the students to my class holding a few earthworms. They were very curious about why I wasn't disgusted with the worms' slimy bodies. I announced that I loved worms, and that they would learn to love worms too. Many of the students thought I was crazy!

To start class I told them the purpose of today's activity and other activities in the future would be to answer the many questions they had from yesterday's class. Before they started their worm observations I spent time discussing the proper treatment of worms. I had them suggest how to handle worms by their observations of how I was holding and viewing the worms as they came into class. We reviewed how to make proper observations using their eyes, ears, and gentle hands.

While the students were making their observations, I had them working in pairs. This was important because they were able to generate more observations and check with one another if the observations were appropriate. They used one sheet to record all of their observations and write any questions they thought of during this activity.

After many of the students completed the Wonderful Worm Observation sheet, I tried to focus their observations with another sheet (Worm Observation Lab). Again, the students were allowed to work together and discuss their findings.

At the end of class I praised them for their focus on learning in class. Many of them were eager to clarify all of their questions and answers they had, but we did not have enough time. I assured them that we would be discussing their observations at the start of the next class.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. While the students were working on both lab sheets, I was able to walk around the room and touch base with each group. To maintain their interest I would have mini discussions about specific questions on the lab sheet with each group. I also encouraged them to find answers to questions they were generating from their own observations. While I was visiting each group, I looked over their shoulders at their work in progress and redirected those who needed redirection. Because the students were so consumed by observing worms, I was not yet able to discuss their learning or collect their lab sheets. To conclude class I asked the students to brainstorm questions about earthworms from observing them.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today. The students learned by observing and felt in control of their learning. All of the students were very focused on today's lesson because they thought they were responsible for coming up with the questions on the Worm Observation Lab sheet.

When I assigned seating for this class, I paired them with differing abilities. Most of the pairs seem to be working well together. I have three pairs of students that I need to continue to monitor to see if they can stay more focused. Today they were not writing as much as other pairs, yet they were consumed by the topic and were focusing more on the worms than filling out the Lab Sheet.

For this lab in the future I think I will review all of the questions on the sheet and discuss my expectations for answering all of the questions, prior to letting the students start that lab sheet. The reason for this is that some students had many inquiries about the questions on the lab sheet. They were also a little reluctant to make educated guesses based on their observations.

Student #3 2/1

Student #3

Wonderful Worm Observations

1. They like to move around.
2. They are very gooey and slimy.
3. They have alot of segments.
4. Are very squishy.
5. They seem to not like eachother.
6. They have a long line going down their mi
7. They could stretch out and squish together.
8. They don't want to stay still.
9. When you touch them they move very fast.
10. They lift up their head alot.
11. The tip of their head is white.
12. When they are close they are darh brown.
13. When they are stretched out they are light brown
14. Their head pops in and out.
15. When they move they move, then step, move, stop ect.

Interesting Observations!! Good Details!

Worm Questions

While you are observing the worms, record any questions you have about the worms.

16. What is the long line down the middle for?
17. Why do they keep picking their head up?
18. How do they stretch out so much?
19. Why do they tangle themselves up?
20. Why are they the color brown?

Think about it, my love!

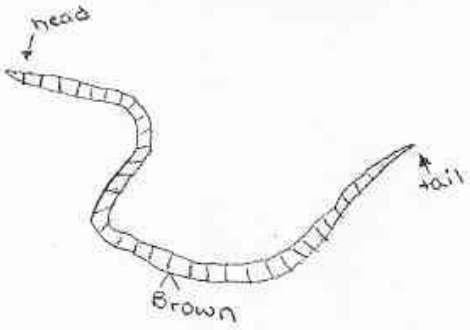
Great Questions! Very thoughtful!!!

Student #3 2/1

Worm Observation Lab

Worm Portrait

(Draw a detailed picture of your worm)



Good!

INVESTIGATE:

C 1. Can you tell which is the front end of a worm and which is its tail? Is there a difference? How can you tell?

Yes, because the head is a little white and that is the direction it moves, Also, that looks like how it sees.

C 2. How do worms move? Explain in detail. Do they ever move backwards?

They move kind of quickly and they move then stop, move, stop, ect. Yes, it looks like they move backwards sometime

Describe what is happening with this segment

C 3. What happens when a worm meets another worm?

When a worm meets another worm it seems like they try to leave eachother but they get tangled up.

What did we discuss in class!

How do you know?

4. Can you find and do you think the worm has:

C a. Ears? NO Why? Because when I make a noise it does

C b. Eyes? NO Why? Maybe because if I put something infront do

C c. Mouth? Yes Why? Maybe because they have to eat

Also or anything

C d. Nose? NO Why? Probably because it is using it's sense to stop.

C 5. How is the worm like you?

The worm is like me because it has ~~eyes &~~ a mouth, and stretch's out. Anything else?

get around what does this mean?

C 6. How is the worm different from you?

The worm is different because I am not long, ~~and~~ slimy, brown, and I don't have all of these segments.

What do you mean? Is the worm long or them y-on??

14

Daily Log #3

Date: 4 February 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? Before discussing the anatomy of worms that was planned for today, we reviewed yesterday's lab sheet. The students were very interested in clarifying all of their observations and answers to questions. For example, they wanted to know what the white ring on one of the worm was for.

Today I expected the students to learn about the anatomy of worms. We discussed the external anatomy and internal anatomy of worms. Included with the internal anatomy were the digestive system, circulatory system, and nervous system. They should have a basic understanding of the functions of the earthworm's body systems. This was a continuation to the essential question: Knowing structure and function, what are the earthworm's needs and adaptations for, their environment?

Describe the instructional strategies, learning activities and resources used by you and your, students during the lesson. At the door today I greeted the students with an earthworm on a transparency sheet. I had a flashlight in my other hand to shine through the worm. I did this because I noticed in many of their observations they were wondering what the stripe in the worm's body was for. The students were excited to see the inside parts of the worm, without hurting the worm. They had many questions, but we first needed to discuss the Worm Observation Lab.

While discussing the lab, I made sure the students validated their answers to the questions by using their observations of the earthworms from the prior day. I also encouraged them to correct their answers during the discussion, if they felt their answer needed improvement.

It is our school policy not to dissect worms. Because of this policy I made a six-foot interactive model of a segmented worm. I told them Wilma the Interactive Earthworm would allow us to see more closely, what they had seen when I had the worm on the transparency. The students were even very curious about the inside parts of the worm from the prior day's observations. I pointed out each part of the worm and had the class guess its importance. I reminded them, during the discussion, that they were able to make good educated guesses from their knowledge of their own body systems. While discussing the worm parts and functions, I had them filling out diagrams of each system of the earthworm.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. During the discussion I was monitoring the students' note taking. If they were not taking the proper notes during the discussion, I either repeated the information or had another student repeat the

information using their own words. I was also monitoring understanding by asking if the students had any questions, and I was including as many students' responses as I could for each question I had for them. For homework during the next few nights they will construct their own worm poster with all of its parts and functions. They will have to combine the three diagrams they filled out in class into one big diagram. This will hopefully help them process and review the information.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today.

Most of my students are either visual or auditory learners. That is why I provided the six foot color-coded worm for the students to see and feel. I also provided the diagrams so they could record all of their information. Discussing for information and clarification helped the students know what to take notes on.

I felt a bit more rushed with today's lesson because I needed to conclude the prior day's lab discussion at the start of class. It was very important that I wrap up the lab because there was a lot of information they were very curious about and it was important for them to know. To be sure they have the information they needed to learn from today's class, I will start tomorrow's class reviewing worm anatomy. I will ask for volunteers to explain each function and have the students double check their diagrams with notes.

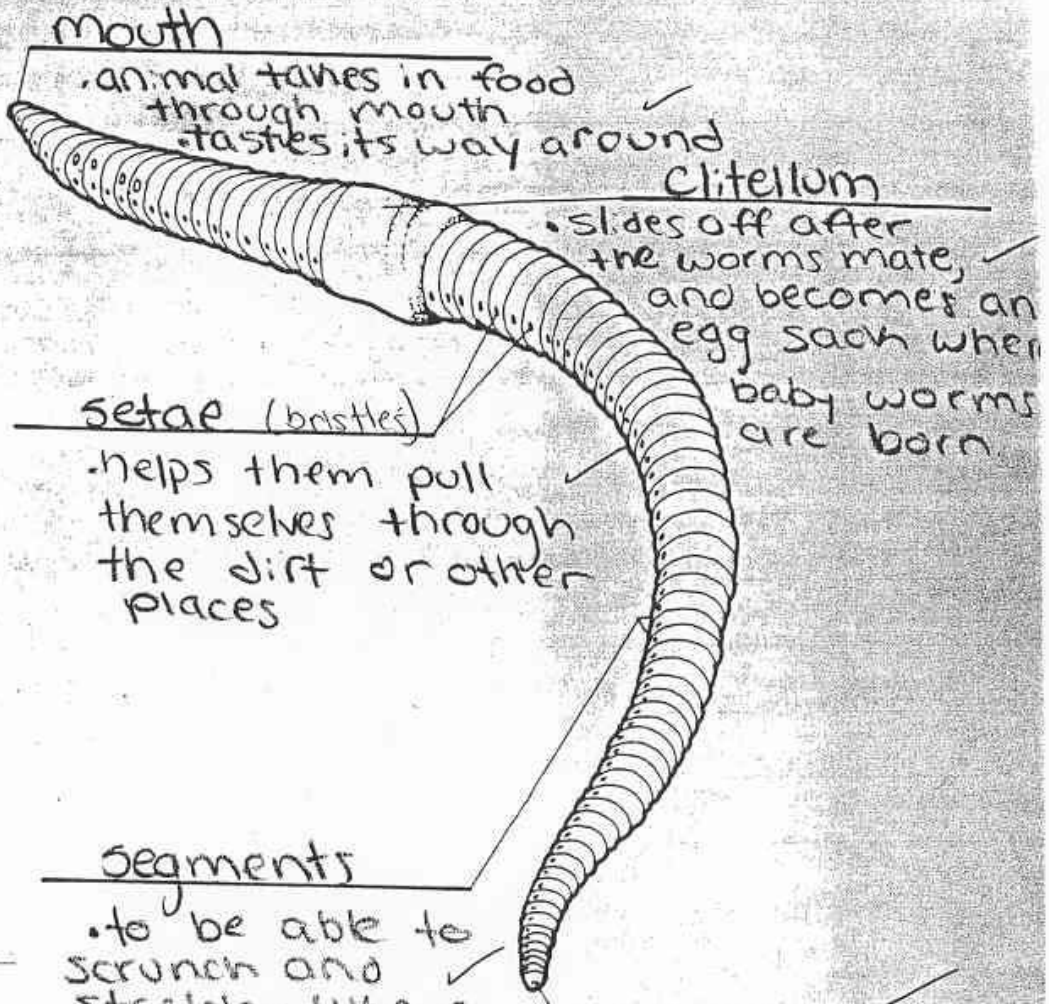
Today, I also seemed stuck in the front of the classroom. That is not generally how I teach. Although I could see that everyone was writing at the appropriate times, I was not checking each individual paper to ensure the students were taking correct and accurate notes. Tomorrow I will have to circulate around the classroom more. I think some of the reason why I wasn't moving around much since the start of the unit is that I just changed the table arrangement in my room right before I started the unit so I could have most of the class fit on camera. So far it is not working for me because it is very restrictive for movement. Before tomorrow’s class, I need to space out the tables more.

The Earthworm

Student #3 2/4/02 Name.

Student #3

Label the exterior parts of the earthworm.



mouth
- animal takes in food through mouth
- tastes its way around

clitellum
- slides off after the worms mate, and becomes an egg sack where baby worms are born

setae (bristles)
- helps them pull themselves through the dirt or other places

segments
- to be able to scrunch and stretch like a slinky to move

anus
- after finish digesting castings come out of the anus. (they go to the bathroom)

WORD BANK

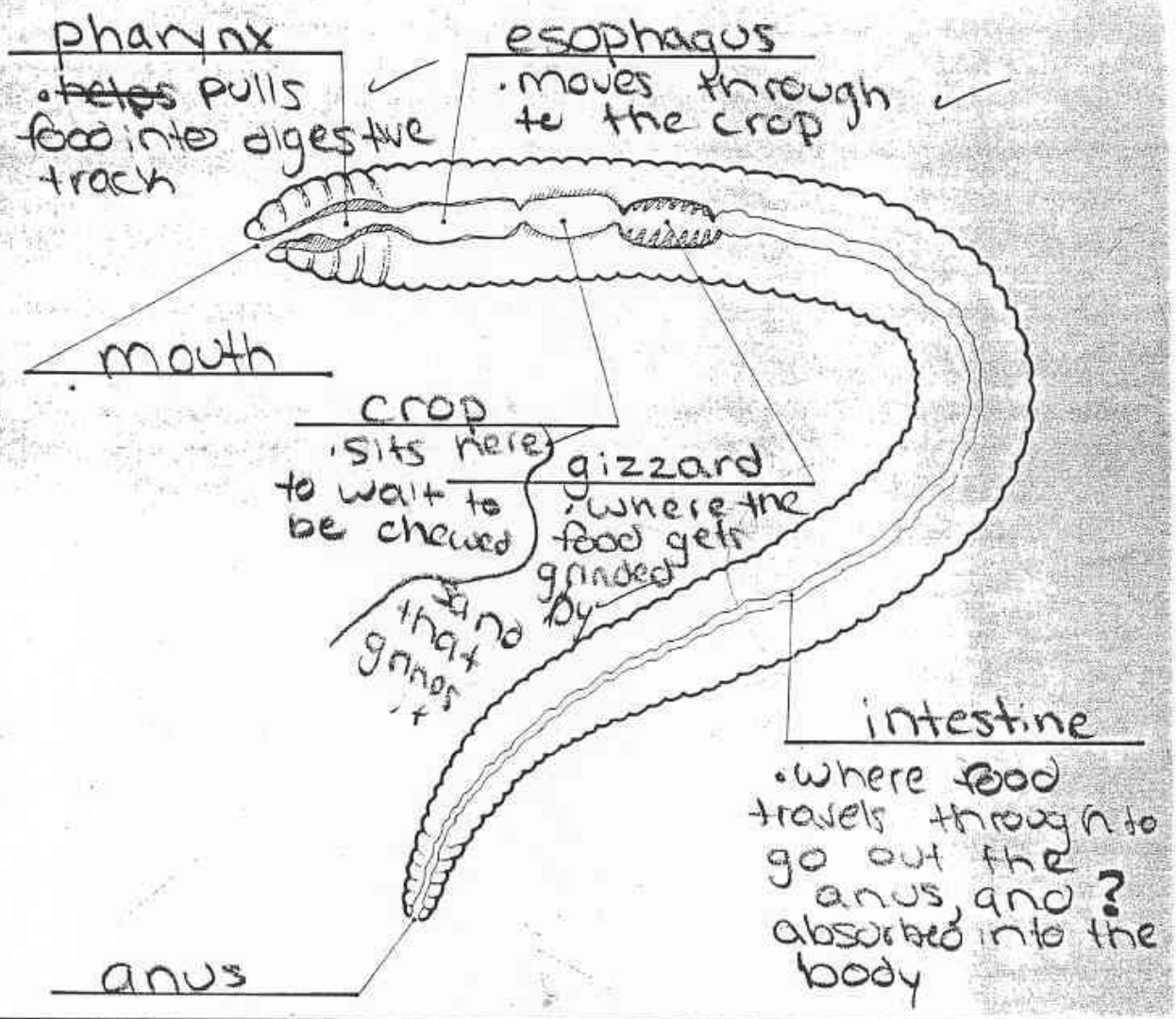
~~mouth~~ ~~segment~~ ~~clitellum~~ ~~anus~~ ~~setae~~

The Earthworm – Digestive System

2/4/02 Name Student #3

For the earthworm, as with most animals, digestion takes place in a long tube with openings at both ends. This tube is divided into organs that do different jobs.

Label the parts of the earthworm's digestive system.



WORD BANK

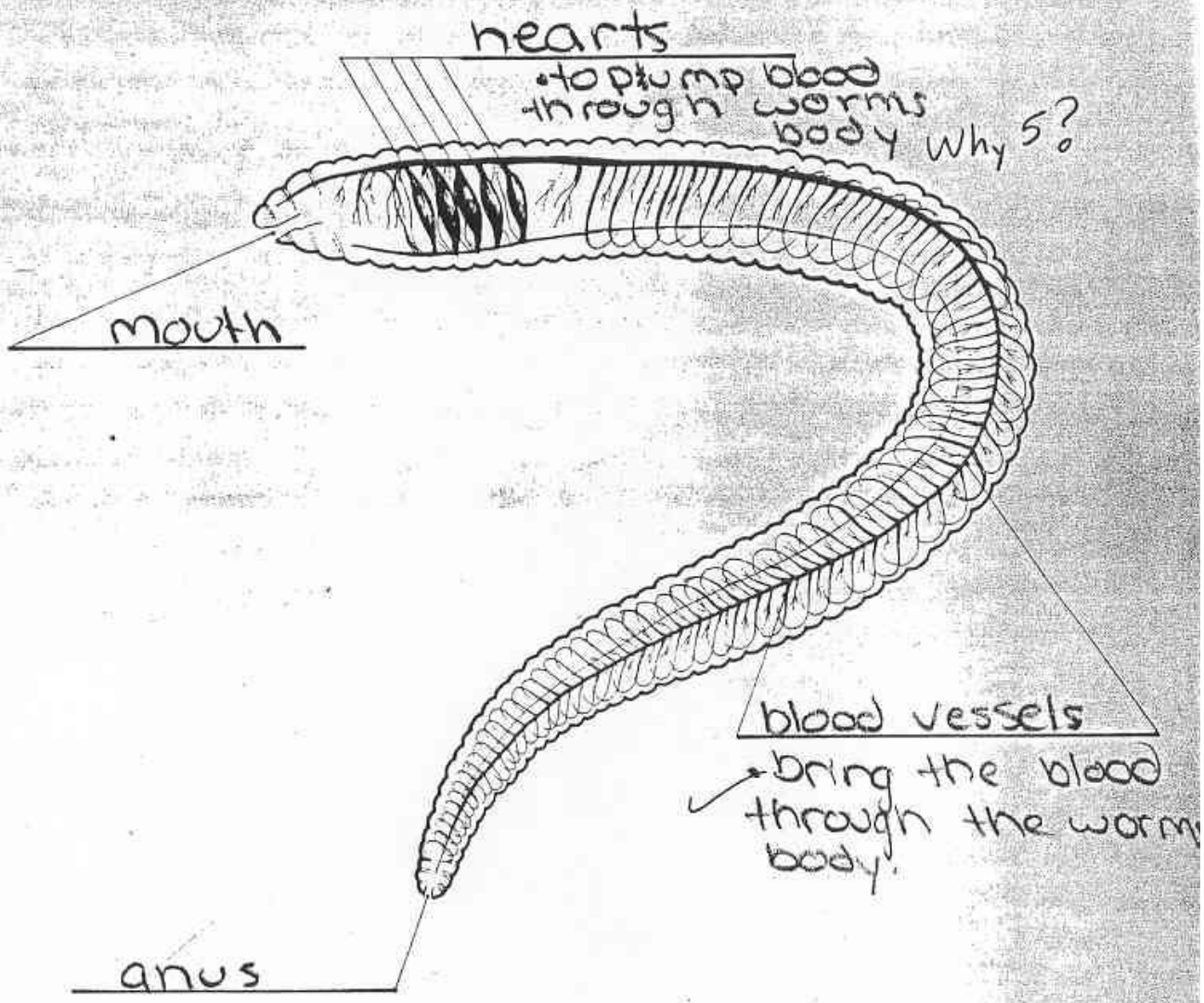
~~crop~~ ~~intestine~~ ~~esophagus~~
~~mouth~~ ~~gizzard~~ ~~anus~~
~~pharynx~~

The Earthworm – Circulatory System

2/4/02 Name Student #3

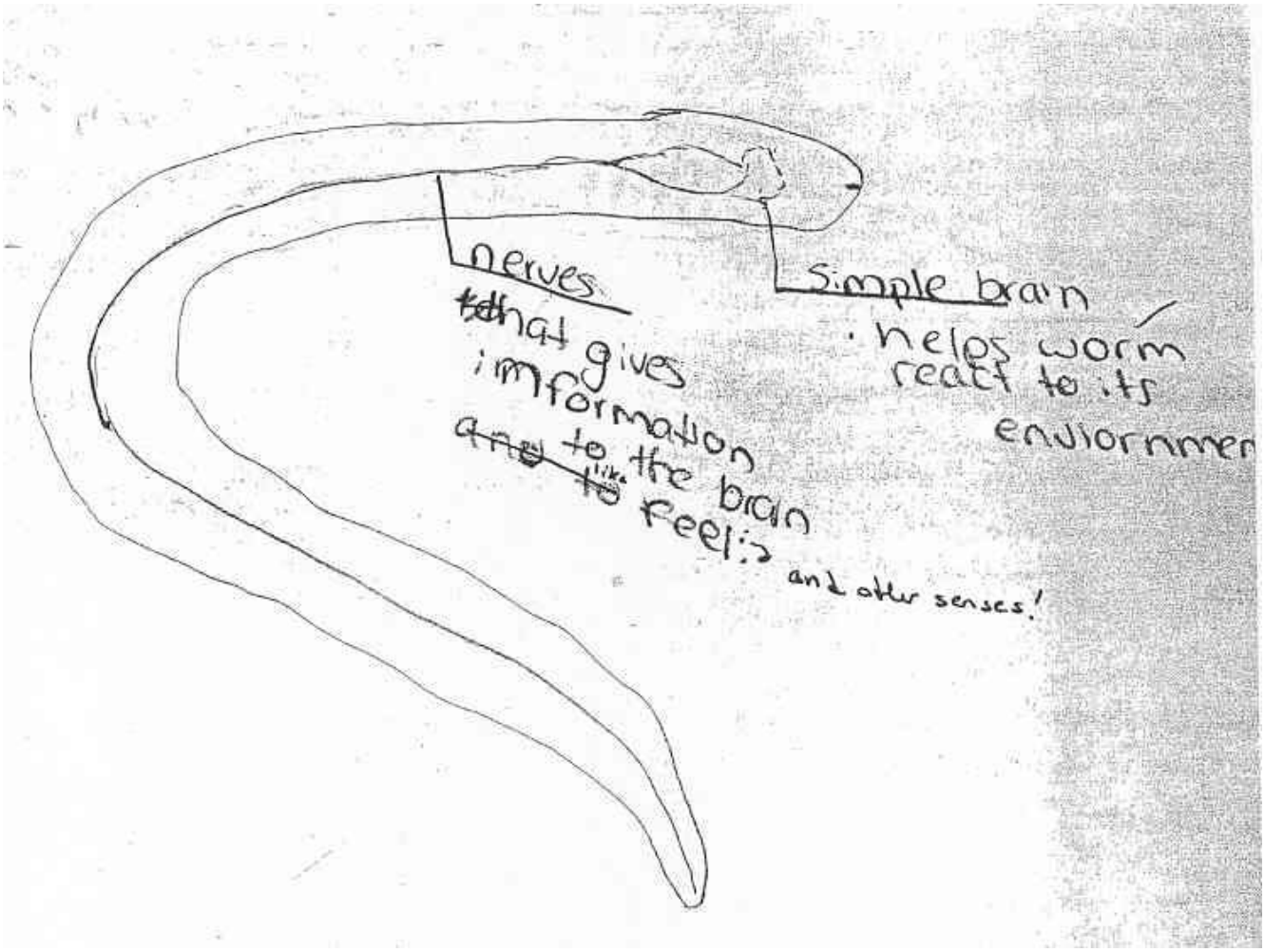
The earthworm's circulatory system is very simple.

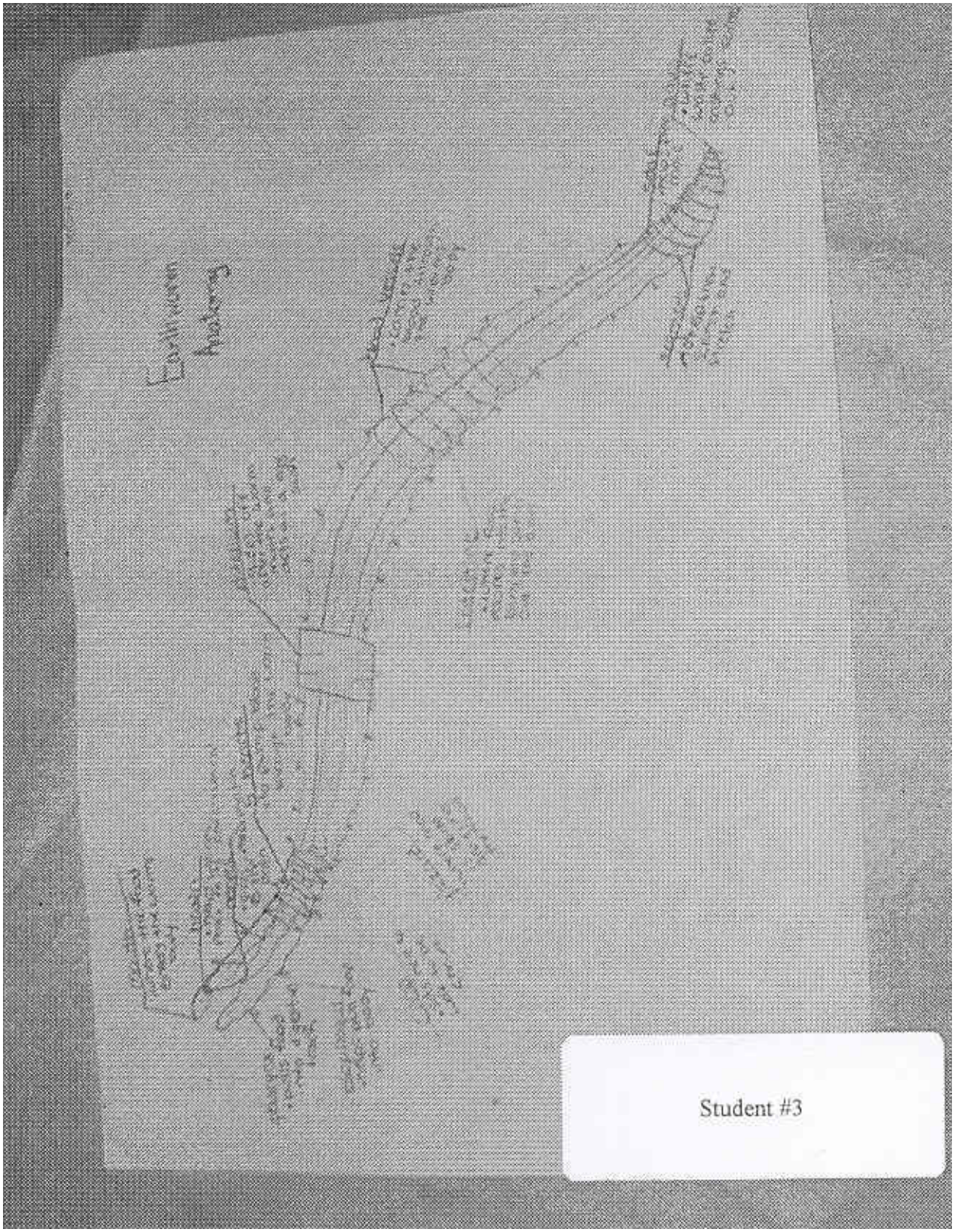
Label the parts of the earthworm and its circulatory system.



WORD BANK

~~hearts~~ ~~blood vessels~~ ~~mouth~~ ~~anus~~


nerves
that gives
information
to the brain
to feel
and other senses!
Simple brain
· helps worm
react to its
enviornmen



Student #3

Worm Poster Grading Rubric

The objective of this project was to illustrate, label, and explain the anatomy of the earthworm.

Title (2 points) **Points Awarded:** 2

0 points: no title stated
1 point: unclear title stated
2 points: title clearly stated

Illustration (6 points) **Points Awarded:** 6

0 points: did not illustrate the internal anatomy of the earthworm
2 points: incomplete or unclear illustration of the anatomy of the earthworm
4 points: generally clear and complete illustration with a minor error or omission
6 points: clear and complete illustration of the anatomy of the earthworm

Labels (6 points) **Points Awarded:** 6

0 points: no labels of anatomy indicated
2 points: labels of anatomy are incomplete, disorganized, and/or hard to read
4 points: labels of anatomy are generally clear and complete with a minor error or omission
6 points: labels of anatomy are clear and complete

Explanation (6 points) How does the setae help them move? What else does the mouth do? What info is given to the brain & the nerves? Clitellum does, become the egg sac which then produces the eggs. **Points Awarded:** 3.5

0 points: no explanations of anatomy indicated
2 points: explanations of anatomy are incomplete, unclear, and/or disorganized
4 points: explanations of anatomy are generally correct and clearly written with a minor error
6 points: explanations of anatomy are accurate, well organized, and clearly written

Format (5 points) **Points Awarded:** 4

Gave yourself credit
Colored
Neat
Organized
Extra Effort
0 points: no
1 point: yes

Overall Points Awarded: 21.5 **out of 25 points**

Grade: 86% = B Good work, but you need to spend more time attending to detail!

Daily Log #4

Date: 5 February 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? Today we reviewed the anatomy of worms at the start of class and clarified the worm poster assignment that was to be done for homework. From knowing about the anatomy of worms, I wanted the students to learn how the digestion process can help the growing food waste problem in our school. The learning expectation for today was for the students to learn about vermi-composting as an efficient form of recycling. I wanted them to research in groups what vermi-composting is, how is it used, and how can it possibly help the community. This was an introduction to the essential questions: Why are earthworms important? How can earthworms be used to address the problem of excess food waste in society?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. To make this assignment much more interesting I had the students believe that they were on a mission from the school student council to research worms as a possibility to help reduce food waste in the school cafeteria. I even had the student council representative in class help describe the assignment to make the assignment much more convincing. For sixth graders I noticed the students care more if it is presented as a kid issue. Their mission was to find out what was positive, negative, and interesting about vermi-composting.

I passed out a sheet with the scenario described at the top and explained their mission. They used this sheet to organize their ideas and data. I passed out folders with websites that had information about vermi-composting. Ideally, if there were more time, I would have brought the students up to the computer lab to do their own Internet research. I decided it would take less time to do the research if I gave each group printouts rather than bringing them up to the computer lab. Using the computers is also limiting because it would be difficult for the students to discuss and share their ideas. For sixth graders many of the students are still struggling with reading for important information. To help them organize their ideas I suggested that they make three columns on their paper: one column for positive facts about vermi-composting, another for negative facts, and the last for any other interesting information they found that might help the student council be more informed.

Because they were exceptionally engaged with researching about vermi-composting, we have to wait until tomorrow to discuss their findings. To conclude, I asked them to form an opinion, based on the facts, whether vermi-composting would positive or negative for the school.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. As the students were researching, I was focusing the students on the information they needed

to have in their notes. I was asking them thought provoking questions which allowed them to take the information they were learning and infer new positive, negative, and interesting information about vermi-composting. For example, many of the students noticed that vermi-composting produces more worms. I asked them how that could be helpful for the school. They thought it might be a good fundraiser to sell worms to the community, so the community could start their own bins.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today.

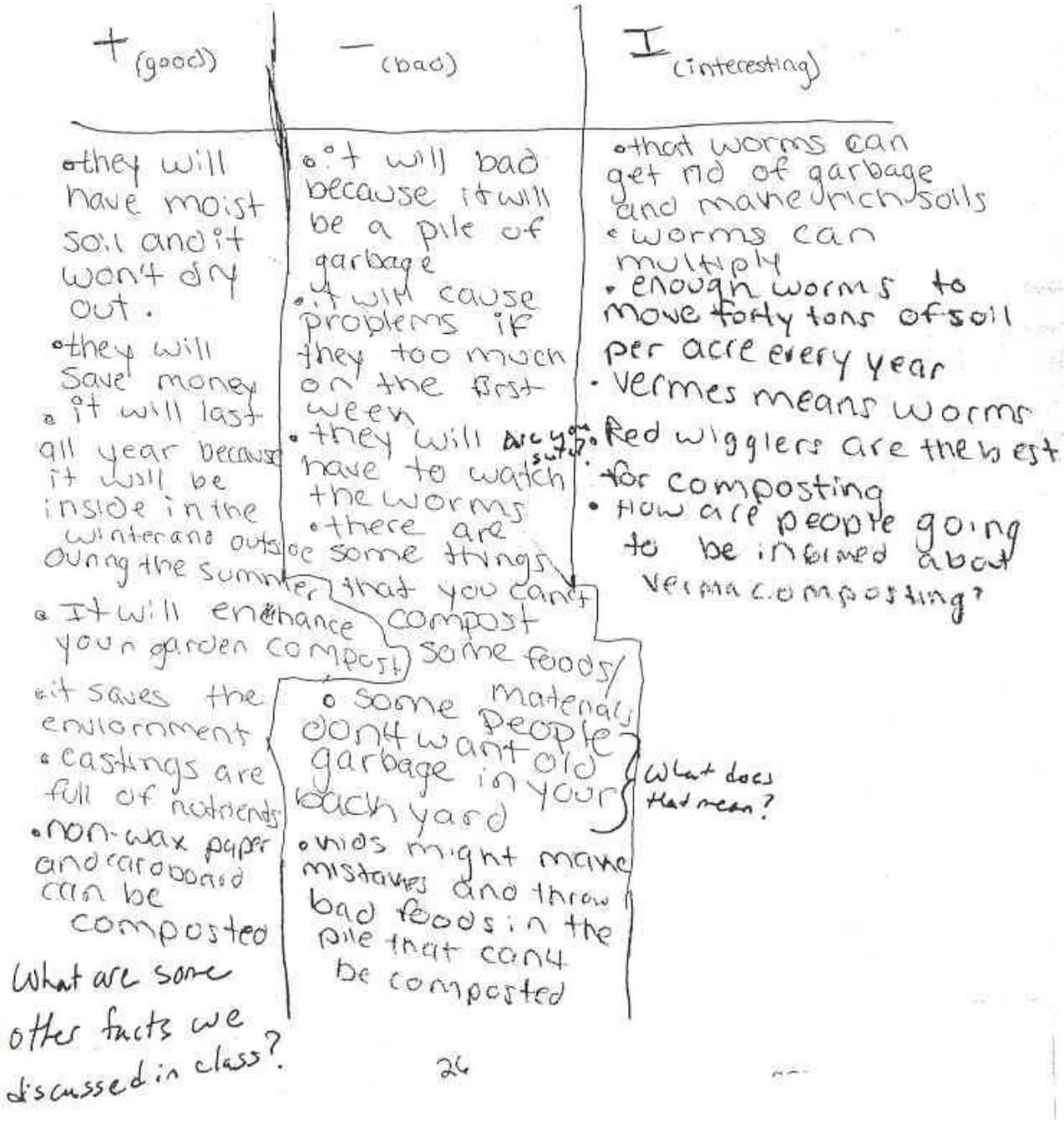
Working in groups of four helped keep all of the students on task. The stronger readers in each group helped the students that have difficulty with reading for information. For the ESL student and all of the students I provided a glossary with vermi-composting vocabulary to help clarify their information. I found this glossary on the Internet, but I think next time I will rewrite each term with a simpler meaning. In the future I will provide them with more than Internet resources for information. Some of the Internet information is a little advanced for my sixth graders, making it difficult to read and understand. I will try to find books or brief videos that might increase their understanding of vermi-composting. The textbooks we are using with the regular science curriculum are lacking information about vermi-composting; therefore, I did not attempt to use them. I think the students did a fine job working with what they had.

2/5/02

Are Earthworms the Solution?

Student #3

The Student Council has been given a small grant to start a recycling program in the cafeteria. They realized that a tremendous amount of food is thrown away each day. The Student Council heard that vermicomposting might be a possible solution to the problem. They do not have much information on this topic; therefore they are asking our class to research the topic because we are already studying earthworms. As a class, your mission today is to determine whether or not vermicomposting is beneficial for our school. What do you think would be positive, negative, or interesting about this type of recycling program? Organize your information below.



Characteristics of Earthworms

The teacher provided a variety of resources which are identified below but not included:

- Worm Word Glossary for Teachers – www.cityfarmer.org
- Nature's Best Fertilizer – www.wormpoop.com
- Vermicomposting: Indoor Composting with Earthworms – www.state.ma.us
- Worm-assisted Composting – www.environmentalindustry.com
- Vermicomposting – Down to Earthworms, Kamloops British Columbia
- Earthworm Biology and Production – hhtp://edis.ifas.ufl.edu (U of FL Cooperative Extension Service)
- Introduction to the Worm Farm – www.squirmy-worms.com
- Beginning with Worms - www.squirmy-worms.com
- Animals in the Soil – www.olywa.net
- Why is the Worm Industry Expanding? – http://vermico.com
- The Circle of the Food Chain and Decomposition – www.amnh.org
- Starting a Worm Farm – www.unce.unr.edu
- Why Earthworms? – www.unce.unr.edu
- A Helpful Home Guide to Composting – Tasman District Council
- A Helpful Home Guide to Worm Farming - Tasman District Council

Daily Log #5

Date: 6 February 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? From discussing their research I wanted the students to learn how vermi-composting was positive, negative and interesting. This was a continuation of the essential questions: Why are earthworms important? How can earthworm s be used to address the problem of excess food waste in society?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. Since this was considered a Student Council issue, I had the student council representative mediate the class discussion. I did this because they believe that this representative will actually go to student council and voice their opinion. The students do not know that this is a made up scenario. I am torn for whether or not I tell them I made this situation up. They seem quite interested in pursuing the topic.

Getting back to having the representative mediate the class, I knew she could keep the students on topic. During the discussion I had her write the information on the board. This helped the students add to their notes. The only time I participated was when the needed clarification on an issue. I tried to stay neutral about opinions of vermi-composting.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. While my students were engaged in class discussion, I was watching to see if they were participating, either by raising their hand and sharing information or by listening carefully and taking thorough notes. I also clarified some misunderstandings about vermi-composting as I saw necessary. I also kept reminding them of the focus of the discussion and asked probing questions to check for understanding. For example, they needed to be reminded that only red wigglers would be the best type of earthworms for vermi-composting.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today. The students had many visual resources to record their learning. I started class having the students review and discuss their notes in their groups. This helped refresh their memories for the class discussion. I had the representative write the notes on the board for the children that have difficulty summarizing a conversation.

The note writing on the board made the conversation a bit slow and drawn out. Next time I will have another student record the notes on the board while the representative is mediating the discussion. I think this will give the discussion more energy and momentum. In the future I might divide the class according to viewpoint (positive or negative about vermi-composting) and make it more like a debate.

Daily Log #6

Date: 7 February 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? Today we reviewed the steps of the scientific method. I did this because I have not given the students a lot of practice with experimental design. We then brainstormed which experiments would be necessary for learning how to build and maintain a vermi-composting bin. The experiment that we did today was about whether worms prefer a damp or dry environment. Students didn't know due to the lack of experiences they had with earthworms. This experiment is a continuation of the essential question: Knowing structure and function, what are the earthworm's needs and adaptations for their environment?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. To engage the students for class I took a poll of the class to see if they thought there were benefits to doing more research for student council to consider vermi-composting in the cafeteria. I asked the students what the next step might be to pursuing this topic. They already knew the benefits. After a little thought they realized they did not know what was the actual approach to carrying out this process. They knew they needed to learn the conditions necessary for building a vermi-composting bin. I told them I was not going to give them this information, but they had to experiment with some of the environmental conditions to discover that information on their own. Today's experiment would be about whether earthworms prefer a damp or dry environment.

To reintroduce the steps of the scientific method I had the students brainstorm the order that would make sense for today's experiment. If a student volunteered with the correct step, I had them stand in the front of the room with a poster identifying that step. After this activity I passed out a lab sheet that guided them through this experiment. I reviewed all of the materials and how they would be used during the lab. It was really important for them to see the initial tray set up for the experiment. They needed to put a dry paper towel on one side of the tray and a damp towel on the other side. I asked the students why it would be important to make sure the worms were placed half on dry and the other half on wet. At first they had a little trouble coming up with why, but soon they realized that due to the fact the worm did not have eyes, they needed to feel the choice between both environments. We also had to discuss why it was important not to touch the worm or disrupt the tray while participating in the experiment. They figured out that it would add a variable not being tested for. We discussed why it was important to repeat this experiment a few times. It wasn't until after

the lab was complete that they realized the true importance to repeating an experiment. The students noticed that the worms did not consistently choose to stay on one side. There was one lab table that the worms, for some reason or another, choose to be on the dry side more often than damp. This helped the students think of some reasons why that might happen. For example, they noticed their worms seemed less mobile than other lab tables. After the lab was complete I drew a table on the board. Students tallied the numbers and concluded that worms preferred a damp environment. Next I asked them why, from their prior knowledge about worms, they thought worms preferred damp environment. They were able to remember that they needed to be damp not only to keep their segments movable, but also they needed dampness to breathe through their skin. I asked them how this impacted their view for making a worm bin. They responded that they needed to somehow keep the inside of the bin damp but not water logged or the worms would drown.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. Student participation helped me monitor their understanding of the scientific process. Many of them had difficulty following the directions about how to do the experiment and record their data. For example, they were to watch the worm for three minutes and record the location of the worm after each minute. Some of the students thought that after every minute they had to re-center the worm between the damp and dry paper towel. They repeated the experiment three times, and as they learned the process, it became easier for them. I moved around the room checking to see if students were following directions and recording their data correctly. They also needed to be reminded to resist the urge to touch the worm during the experiment trials. I collected their lab sheets to see if they filled out the data table correctly and made conclusions based on worms preferring a damp environment. They seemed to do all right.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today. I had the students work in groups of four to help those who might have had trouble with directions. Because four was a large group to be watching one worm, it was more interesting for each pair to be observing their own worm in the tray. This especially helped the students stay interested if one pair's worm wasn't moving and the other pair's worm was.

This lab was very structured because my plan for tomorrow was to take some of the structure away. I think they will still need a guide sheet that has the steps of the scientific method on it, but they can fill in the spaces for what needs to be done for each step. Today I forget to

include a materials list with the experiment. Tomorrow I will have to discuss this missing information and why it is important.

Student #3

Name: 2/6/02

Worm Experiment 1

Question: Do worms prefer damp or dry?

Hypothesis: I predict the worm(s) will choose damp.

Experiment Directions:

1. Cover one half of your worm tray with a damp paper towel.
2. Cover the other half with a dry paper towel.
3. Place your worm in the center of the paper towel: one end on the damp, one end on the dry.
4. Watch your worm for 3 minutes. Record where the worm is located each minute, damp or dry. Repeat 2 more times.

Observations:

Trial Number	Minute 1	Minute 2	Minute3
Trial 1	damp	damp	damp
Trial 2	damp	damp	damp
Trial 3	both	damp	damp

Results: How many times did the worm choose: damp 9 dry 1

Conclusion: This worm prefers: damp ✓ dry ____

Why do you think this happened?

Did you mean damp?

I think this happened because they are trying to keep their skin dry so they can breathe through it. Also they need to be able to glide across surfaces so they need to stay moist.

Daily Log #7

Date: 8 February 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? During this lesson I wanted the students to again use the steps of scientific processes to discover that worms prefer a dark environment to a light environment. I also wanted them to brainstorm and discuss new experiments that could be done to learn more about worms to give them an appropriate environment. This experiment is a continuation of the essential question: Knowing structure and function, what are the earthworm's needs and adaptations for their environment?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. I reminded students of the importance of learning about the best environment for worms. Again it was not so obvious to them what the outcome of this experiment would be.

After writing their questions and hypothesis for this experiment on their lab sheet, I showed them the materials they were going to be using. One student identified that they would be using a damp paper towel at the bottom of their tray because they knew that it would make the worms a bit more comfortable for reasons discussed yesterday. The only different material used today was a piece of black construction paper. I asked the students what they thought the purpose of the black paper was. One student volunteered that it would be used to cover half of the tray to act as the dark side. As we were discussing how the experiment was going to take place, they were writing the directions in their own words on their lab sheets.

I asked them why it was important not to touch the tray or worm during the experiment. They remembered that it would act as another variable that we were not testing for. Prior to the start of the experiment I asked students if there was any other important information they needed to remember. They remembered that they needed to expose the worm to both sides of the tray to give the worm a choice and to watch the worm for three minutes recording their data after every minute. Also they needed to repeat the experiment.

When each table completed writing their directions, they were allowed to gather their materials and start the experiment. They worked with two worms in a tray and each pair kept track of their worm.

When the students completed the experiment, I drew a table on the board and asked them for the results of their experiment. Students identified that the worms preferred dark. I asked the students why they thought the worms choose dark, and they needed a few seconds to think about it. They all agreed that it would take a worm a lot longer to dry out exposed to the dark than being exposed to the

sun. I asked them how this would affect the building of the worm bin. I showed them one model that was made of clear plastic and another made of opaque plastic. Once again, I had to give them a little time to think and then took a poll to see which was model best. They said it would be darker in the opaque container. One student recommended that they could use the clear plastic container as long as the sides and lid were covered by something dark during the day.

I asked them to think about another reason why they would want a dark container. I asked them to think about when and how worms get their food, if it isn't always underground. After some thought and discussion, they realized that worms must be active at night, safely eating the food on the surface. I asked them why that was an important piece of information. One student responded that if the entire container were kept dark including the lid the worms would be able to compost throughout the container.

Next, I asked them to brainstorm additional experiments that would be useful to making the worm bin. The students decided that they should find out if worms prefer a warm or cool environment. They noticed from earlier research that there was not any consistent information about proper temperature. They realized that they needed to find a location for the worm bins and temperature would be the deciding factor.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. Through class discussion and small group discussion, I was able to verify that the students understood how to carry out the experiment and learn important information from this experiment that would impact the building of the worm bin. I also collected the lab sheets that they completed and saw that all of the students really understood the scientific process for carrying out an experiment.

Describe how you accommodated students' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today. I had students work in groups of 4 and also in pairs to help those having difficulty with directions or writing. Today's lesson was very structured using a lab sheet. Tomorrow I will have students try to write up the experiment on their own. This will show me that they understand the steps need to be done in order. In future units I know more experiments need to be arranged using the scientific method to help students be more fluent with this process.

Name: Student #3 2/7/02

Worm Experiment 2

Question: Do worms prefer light or dark? ✓

Hypothesis: I predict the worm(s) will choose dark ✓

Materials: Worm(s), timer/stopwatch, black piece of paper, square tin, damp paper towel,

Experiment Directions: Good Directions!! ☺

1. Put damp paper towel in the square tin, ✓
2. Cover ½ of the square tin with a piece of black construction paper.
3. Place worms between the two halfs. How?
4. Watch worm for 3 min. and record where the worm is each minute. Repeat 2 more times.

Observations:

Trial Number	Minute 1	Minute 2	Minute3
Trial 1	light	light	light Interesting?!
Trial 2	dark	dark	dark ✓
Trial 3	dark	dark	light

Results: How many times did the worm choose. dark 5 ✓ light 4.

Conclusion: They prefer dark. ✓

Why do you think this happened? I think because the light could dry the worms out and the soil is dark.

↑ Why is that a bad thing?

Daily Log #8

Date: 11 February 2002, Lesson length: 90 minutes

What did you expect students to learn during the lesson? Today I wanted the students to decide on the best location for the worm bins, whether they should be located in a warm area or cool area. I also wanted them to do further research about building a vermi-composting bin and providing a healthy environment for the worms. This experiment is a continuation of the essential question: Knowing structure and function, what are the earthworm's needs and adaptations for their environment?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. Many of the students brought in the materials needed for today's experiment. They explained to me how they were going to be used and why it was important to do this experiment. It did not take them too much time to get started and carry out the experiment. They were very excited that they were in charge of planning all aspects of this experiment. When they were finished with the experiment, we again posted the results of all of the pairs on the board. They identified that the worms preferred a cooler environment. They decided that it would be best to keep the worms near by the cafeteria in a cool spot, away from any heat sources.

Next, in the groups of four, students went to the original information packets I made for them to learn the importance of vermi-composting to find additional information about preparing the worm bin. They recorded their information on a sheet provided to them. After recording the information, we discussed what they had learned as a class.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. Today I spent much of my time walking around the room to make sure students were headed in the right direction with today's experiment. Surprisingly, all of the groups were carrying out the experiment just like the other two previous experiments were carried out. They were very enthusiastic about doing this experiment because it was their idea.

Other ways I monitored my students was to have a class discussion about how all three experiments impacted the making of the worm bin. Tomorrow I will collect their formal written experiment to see if they understood the steps of the carrying out an experiment and learning from the experiment.

Describe how you accommodated students' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today. Working in groups helped guide some of the students that struggle with writing and following directions. They also worked in their groups of four to do the research to find the best conditions for a

worm environment. For those who needed a challenge I told them to try graphing the information from today's experiment using their data and also the class's data. The ESL student appears to be keeping up with the class because she is working next to a capable and understanding student. I feel that I did not spend a lot of time showing the students the different ways to represent data. In future labs I think I will be expecting all students to graph their results to help them interpret data and draw conclusions.

Worm Experiment 3

Question: Do worms prefer warm or cool?

Hypothesis: I predict that worms will choose cool.

Materials: The materials needed are:

- ice pack
- tin plate
- warm towel
- pencil & lab sheet
- damp paper towel
- worm(s)
- stopwatch

Experiment Directions:

1. take a tin plate, and place a damp paper towel in it (because worms prefer dampness).
2. on one half of the tin, put a ice pack under one side, and the warm towel under the other side.
3. place the worm(s) in the middle and start the stopwatch.
4. while you are timing, push the plate down on the two sources so that the worms can feel both.
5. After one minute is up, right down the result on the space provided.
6. watch your worm for 3 minutes, and repeat 2 more times.

Observations:

Trial Number	Minute 1	Minute 2	Minute 3
Trial 1	Room temperature	Room temperature	Room temperature
Trial 2	Room temperature	warm	cool
Trial 3	warm	Room temperature	cool

Results: The worm picked, warm~ 2, cool~ 2, and room temperature~ 5.

Conclusion: In conclusion worms prefer cooler temperatures over room, and warm.

In conclusion, my results state that worms prefer room temperature. I got 2~warm, 2~cool, and 5~room temperature. The classes results show that worms prefer cool because they got 8~ warm, 52~cool, and 21~room temperature. I think this happened because the room temperature was pretty cool so both results sound correct.

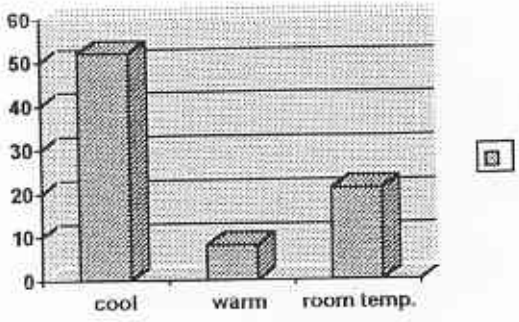
Student #3

2/11/02

Lastly, from all three of our experiments it shows that worms prefer, cool, damp, and dark environments. We used the black paper for dark and light, the ice pack & washcloth for cool and warm, and towel & damp towel for damp and dry.

Why do you think this happened? I think this happened because if worms like damp then most things that are damp become cool. Also they live outside where it rains, cold rain, and the weather is sometimes cool. For darkness, I think they prefer dark because the dirt/soil that they live in is black, or dark. Lastly, I think they prefer damp because when it rains outside, the dirt becomes wet and their environment becomes damp.

Class Results:



Worm Experiment #3 Grading Rubric

The objective of this experiment was to determine the environmental conditions for vermicomposting.

Question (1 point) **Points Awarded:** 1

0 points: no question stated
1 point: question stated

Hypothesis (1 point) **Points Awarded:** 1

0 points: did not answer question
1 point: answered question

Material (3 points) **Points Awarded:** 2

0 points: did not list materials
1 point: incomplete list of materials
2 points: complete list of materials with no quantities indicated
3 points: complete list of materials with quantities indicated

Directions (6 points) **Points Awarded:** 5

0 points: no directions indicated
2 points: directions are incomplete and disorganized
4 points: directions are generally clear and complete with a minor error or omission How will the worms be placed in the middle?
6 points: directions are clear and complete

Data (3 points) **Points Awarded:** 2.5

0 points: no data reported
1 point: no data table, or the data table is incomplete and disorganized
2 points: data table is generally correct and clearly labeled with a minor error or omission What do you mean by room temperature?
3 points: data table is well organized and clearly labeled

Results (2 points) **Points Awarded:** 1 +1 for graph Nicely Done!! ☺

0 points: did not include results
1 point: included your own results
2 points: included your own and class results
(Extra point for graphing class or own results)

Conclusion (6 points) **Points Awarded:** 3

0 points: no conclusion reported
2 point: conclusions are not supported by the experimental data and results, are unclear, disorganized, or illogical The conclusions seem disorganized and unclear. They do appear accurate
4 points: conclusions are generally clearly stated and supported by experimental data and results, except for a minor error or omission.
6 points: conclusions are clearly stated and supported by the experimental data and results

Format (3 points) **Points Awarded:** 3

Experiment was typed ☺
Organized Lab Format ☺
No larger than 14 pt font ☺
0 points: no
1 point: yes

Overall Points Awarded: 19.5 **out of 25 points**

Grade: C+ (93) Please look over this rubric and correct your write up! I can tell you spent a lot of time on this so please fix your mistakes to increase your grade! SCO2

Daily Log #9

Date: 12 February 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? I expected students to learn to make a worm bin and value the importance of vermi-composting as a new way of recycling. This was a continuation of the essential questions: Knowing structure and function, what are the earthworm's needs and adaptations for their environment? Why are earthworms important? How can earthworms be used to address the problem of excess food waste in society?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. Before making the bins we reviewed the materials that were important for making a worm bin. We also discussed the importance of each step of the worm bin. For example, students knew that there needed to be two bins, one to put holes in the bottom so the worms would not be too wet and drown and the other bin was to catch the water from the bin with holes. They also knew that the bedding needed to be damp and fluffy for good worm movement. I modeled to the students how to prepare the bedding which were strips of newspaper dipped in water than squeezed to remove excess water. Additionally, they knew the lid to the bins needed to have holes for the worms to breathe. Prior to the students starting the activity, I asked them how the worms were going to digest their food. One student remembered that there needed to be sand in the bin for the worms to swallowed and leave in its gizzard to grind up the food. After I made sure they knew what they were doing, they worked in their groups and gathered their material and started to make the bins. The students enjoyed this very active hands-on activity.

To complete this unit students needed to write to student council explaining whether or not they thought vermi-composting was a good idea for the school.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. It was important to review the set up of the worm bin before allowing the students to get started on the project. Their participation during the instruction and the project showed me that they understood my directions. I found that the students were very eager to apply what they had learned about making a worm bin.

I plan to read students letters to find out if they have a grasp on the subject. This letter should help me see if they find earthworms and vermi-composting beneficial to our environment.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today. Working in groups and clarifying the steps needed to make a worm bin helped those who have

difficulty with directions. I also participated along with the students to show them that this was even important enough for me to be a part of this activity. This brought a lot of encouragement to the groups that were working a little slower and motivated them to finish the project.

To reinforce what they learned from making the worm bin, the next time I do this lesson I think I will have students write the directions and explain why each step of making the worm bin was important. I think I will also have to stress that red wigglers are the best type of earthworm to do this type of composting. I think some of my students still think they can use any earthworm for vermi-composting.

Student #3 Student # 3 2/12/02

Best Environment for Worm Bins

Experimentation & Research Results:

- they Live a dark enviornment (sp)
- they Live a moist enviornment (sp)
- need sand in your worm bin
- need dead ~~critter matter~~, and plants so they could eat them and produce castings that are full of nutrients
- ~~could be mixed with potting soil~~

Missing some info! In the future, add more notes during the class discussion!

How much? A lot? A little?

← Better off with just plant materials. Animal stuff might smell bad! Y.

← That would be after vermicomposting

- They need to eat and some Earthworm Preferred food is:

↑ What kind?

• Banana peels	• orange peels	Yes!!
• Apples	• grapefruit rinds	
• pears	• tomatoes	
• onion peels	• cabbage	
• carrots	• celery	
• cucumbers	• lettuce	
• beans	• broccoli	
• kale	• Tea leaves	

- put eggshells in the compost pile for a good source of calcium and protein
- don't put seeds in bin because it could cause plants to grow
- A bin could be made out of cinder blocks

What else?

- should be about two feet high ← Why? Is that necessary?
- need lid to think it's dark
- ~~little~~ holes so they ~~think~~ could breathe
- air space so they could move

What are you going to use for bedding? Why?

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Student Council Letter

The objective of this letter will be to persuade the student council to consider (or not) vermicomposting in the cafeteria.

Introduction Paragraph

Your first paragraph will be your entrance into the piece and should establish to your reader who you are and why you are writing this letter. Why have you decided to support vermicomposting (or not) and what makes you the expert on this subject?

Remember:

1. Grab the readers interest
2. Include your position on vermicomposting
3. Establish credibility to your reader

Body Paragraphs

When you are finished with your introduction you will explain the following topics in your letter:

Why is important (or not) to recycle food waste?

What worms are the best composters?

How can vermicomposting help (or not help) the school?

How can vermicomposting help (or not help) the community?

What are your recommendations for making a worm bin?

Remember:

1. Organize your information in the best order that makes sense.
2. Sight specific evidence and examples from research that will help prove or illustrate your purpose or main idea.
3. Try to use transition sentences between paragraphs.

Conclusion Paragraph

The conclusion will be your final chance to make one last attempt at persuading the student council to take action and help support (or not support) vermicomposting.

Format

Letter must be typed

Use Business Letter Format

No larger than 14 pt font

Student Council Address is:

468 South Avenue

New Canaan, CT 06840

A 7

Good luck and have fun! SC

Student Council Letter

The objective of this letter will be to persuade the student council to consider (or not) vermicomposting in the cafeteria.

Introduction Paragraph

Your first paragraph will be your entrance into the piece and should establish to your reader who you are and why you are writing this letter. Why have you decided to support vermicomposting (or not) and what makes you the expert on this subject?

Remember:

1. Grab the readers interest
2. Include your position on vermicomposting
3. Establish credibility to your reader

Body Paragraphs

When you are finished with your introduction you will explain the following topics in your letter:

Why is important (or not) to recycle food waste?

What worms are the best composters?

How can vermicomposting help (or not help) the school?

How can vermicomposting help (or not help) the community?

What are your recommendations for making a worm bin?

Remember:

1. Organize your information in the best order that makes sense.
2. Sight specific evidence and examples from research that will help prove or illustrate your purpose or main idea.
3. Try to use transition sentences between paragraphs.

Conclusion Paragraph

The conclusion will be your final chance to make one last attempt at persuading the student council to take action and help support (or not support) vermicomposting.

Format

Letter must be typed

Use Business Letter Format

No larger than 14 pt font

Student Council Address is:

468 South Avenue

New Canaan, CT 06840

A 7

Good luck and have fun!

SC

Student Council
468 South Avenue

Dear Student council:

I, , want to show you how important vermicomposting is and all of the advantages to it. My class and I have done a lot of research on this topic and so far we have found what worms to use, what they like to eat, what to and not to put in the piles/bins, and all of the general facts of vermicomposting. Vermicomposting sounds like a great idea and I think that Middle School should consider putting compost bins in the cafeteria to reduce the amount of waste, and to produce rich soils for gardens. This is a very fun thing to do and great for making healthy soil, especially if you use the proper worms.

Composting with the red wiggler worms, is a great idea. It is really important to recycle the foods that are leftover because you could use it for helpful things instead of throwing them in a dump! The worms eat all of the dead animal matter and plants, produce castings that are full of nutrients, and make air tunnels through the soils so there is space for roots. This will help our school and even other schools by reducing the amount of garbage we have and use it for something important, like gardening. This won't only help schools but communities as well because they will have less garbage, more soil, and prettier gardens outside. This is really easy too, because all you have to do is make a worm bin.

To make a worm bin you would take two separate bins and one lid. Then after putting one bin to the side you would punch holes in the bottom of one bin for water drainage, and holes in the top of the lid for air for the worms to breathe. After you are done with that step, you place damp shreds of newspaper in the bin with holes in it until it reaches the top, but you don't' want it to wet because worms only like the damp. Third, you should put a couple of cups of sand in it so they could eat it and it could sit in its gizzard to grind up foods. Lastly you should place the bin with holes, with the lid on it, in the other bin so the water that comes out the bottom goes into the other bin. It's that simple! And soon enough you will have tons of rich soil to create a healthy garden! This is a great idea ; should definitely try it!

In conclusion, I hope you are well convinced that vermicomposting is a great way to reduce the amount of food waste and have rich soils for gardening. Lastly, I think you should definitely take action and build a worm bin and you will have rich soils for farming, and selling! Making a worm bin is easy, and look at all of the advantages, and results?! In conclusion, I hope that when you are done reading this paper you want to get up and start vermicomposting right now!

Sincerely,

Student #3

Student Council Letter Grading Rubric

The objective of this letter was to persuade the student council to consider (or not) vermicomposting in the cafeteria.

Introduction Paragraph (6 points)

Total Points Awarded: 5

Grabbed the readers interest	0	(1)	2
Included your position on vermicomposting	0	1	(2)
Established credibility to your reader	0	1	(2)

0 points: Did not include information
1 point: Included the information, but weak
2 points: Included the information and met expectation

Body Paragraphs (12 points)

Total Points Awarded: 10

Why is it important (or not) to recycle food waste? what else did we discuss in class?	0	(1)	2
What worms are the best composters? How do you know?	0	(1)	2
How can vermicomposting help (or not help) the school?	0	1	(2)
How can vermicomposting help (or not help) the community?	0	1	(2)
What are your recommendations for making a worm bin?	0	1	(2)
Organized your information in the best order that made sense	0	1	(2)

0 points: did not answer the question
1 point: partially answered the question
2 points: sighted specific evidence and examples from research that answered the question that helped prove or illustrate your purpose or main idea.

Conclusion Paragraph (4 points)

Total Points Awarded: 4

0 points: no conclusions made
1 point: conclusion did not support original position
2 points: conclusion weakly supported the original position
3 points: conclusion supported the original position without much persuasion
4 points: conclusion was highly persuasive and supported the original position

Format (3 points)

Total Points Awarded: 3

Letter was typed	0	1
Business Letter Format	0	1
No larger than 14 pt font	0	1

0 points: no
1 point: yes

Overall Points Awarded: 23 out of 25 points

Grade: A- Nicely written!! 99

Daily Log #10

Date: 13 February 2002, Lesson length: 45 minutes

What did you expect students to learn during the lesson? There was not much time to learn today, but I wanted students to reflect on their learning by taking the Worm Quiz. They also had an opportunity to reflect on their learning by writing persuasive letters to the Student Council. This was my final evaluation about how much students learned about earthworms and wermi-composting. This concluded my essential question for this unit: Knowing structure and function, what are the earthworm's needs and adaptations for their environment? Why are earthworms important? How can earthworms be used to address the problem of excess food waste in society?

Describe the instructional strategies, learning activities and resources used by you and your students during the lesson. I had students clear their table and have nothing out but a pencil or pen. I passed out the quiz, and reminded students that they had 35 minutes to complete the quiz.

Describe how you monitored students' understanding of the lesson's main concepts and what you found. When I corrected the quizes, I found that students could apply their knowledge from this unit by the way the questions were answered. They also seemed very passionate about their letters to the Student Council. Most students included all of the necessary information in their letters encouraging the Student Council to consider vermi-composting for the school.

Describe how you accommodated student' learning needs during the lesson, and how you plan to adjust your teaching for the next lesson, if necessary, based on the students' learning today. All of the students took the quiz. I gave some of the students with disabilities and the ESL student a word bank to use to answer some of the questions. I made sure that they also had additional time to complete the quiz if they needed it.

Only a few of the students had difficulty writing the letter. This involved format concerns, not content. A few left out a conclusion in their letter. Most of the students wrote letters and have a lot of interest in sending the letters to the Student Council. Although it was not my original plan to forward the letter, I will accommodate the students' interests and send the letters to the Student Council for an official response.

Name: Student #3 Date: 2/13/02 Period: 9

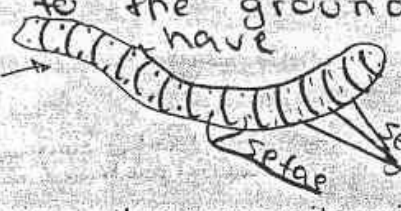
nt #3

45.5/50 91%

Earthworm Quiz

1. Draw and explain how an earthworm is adapted to moving underground. 4 points

An earthworm is adapted to moving underground because it has setae that are like bristles that stick to the ground to help them move. Also they have line segments that help them scrunch and stretch to move far.



Nice illustration!

2. Compare how an earthworm senses its environment with how you sense your environment. 10 points (-1)

We have the same 5 senses as worms, hear, see, taste, smell, and feel. But, we have ears, eyes, tounges, noses, and skin to use all of the senses. Worms only have one of these, a mouth for taste. But they could also sense light or dark for seeing, have cells on top of their heads for smelling. hearing, and have skin along their body for feeling.

how?

vibrations

3. Would you recommend earthworms for a garden? Compare how a garden would be with and without earthworms. 9 points

Yes, I would highly recommend earthworms for a garden. This is because with worms, they produce castings that have very good nutrients to make a healthy garden. Also, they eat dead plants and animal matter so they aren't left in the soil. Lastly, they make air tunnels as they move through the dirt, this will make room for roots on a plant to grow. Without worms none of this would happen and you would have dead things all over your garden no room for roots to grow, and no healthy

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Student #3

4. Do you think vermicomposting is important? Why is it used? 9 points (-2)

vermicomposting is an important thing to do. This is because you could have great, healthy soil for your garden full of nutrients for plants to grow. Also, this produces less garbage waste and no more dumps so there is more room for more important things. Vermicomposting is used because to reduce the garbage, for great soil to make a great garden, and also to sell to others for a great garden and great foods/plants.

What will you do with the garbage worms can't eat? What waste can you use for vermicomposting? why? -2

5. How would you create a worm bin? Explain why each component is important. 15 points (-1.5)

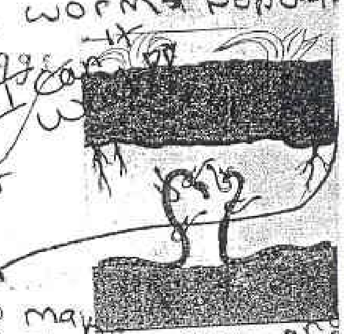
-To create a worm bin you would first take two bins to put the worms and other materials in. Then you would put one aside and punch holes in the top of the lid and the botton of the bins (in the other one). This is to let the worms breathe and have fresh air and to drain out water. Then you would shred peices of newspaper because they have to be small for them to move and dip them in water because they like dampness. (*) Then you would ring out the news paper peices and put them in the bin with holes. After you fill the bin to the top with damp newspaper peices you would dump a couple cups of sand in the bin so it could get into the worm and into the gizzard to grind up foods. Lastly you would put your red wiggler worms in.

why? why?

(*) because they like damp not only wet

6. Assess why some worms in the class worm bin are lacking their clitellum. Predict what is going to happen to the population of worms in the bin. 3 points Some worms are lacking a clitellum because that means that they just recently shed theirs and it is off now with eggs in it. This means that the worms population is going to increase because the eggs in the sacks will probably hatch.

Like what? .5



and then your old foods (not plastics or cardboards), and your worm bin is finished! But, you have to make sure that you have to ... because that ... worms prefer. Then ...

103

SCO2

Wondering about Worms

Student #1

Welcome to the wonderful world of earthworms! Before we start, I would like to know what you know about earthworms and what you would like to know about earthworms. Below, write your responses.

1|31|02

I know that worms....	I want to know... (Who? What? Where? Why? When? How?)
• They clean the soil • Have a segmented body • They have an anus and a head • They have 1 brain and 2 nerves • Feel cold and moist • Heterotrophs • Inverterbrates • Eat dead plant and animal matter • Can regenerate Good memory!	• What do they give the soil? • How do they reproduce? • How long do they live? • Do they build a colony like home? • How do they digest their food? • Do they sleep? • Can they live in cold place • Do they have eyes? • What is the Knot or bigger section? Thoughtful Questions!! Together we will be answering many of the with this unit. If we don't answer them all feel free to research this topic on your own for extra credit, share your information with the class!

Wonderful Worm Observations

2/11

1. Curls and uncurls body to move
2. They feel gooey
3. They look moist
4. Can stretch out body really long
5. Fat at one end and thin at another
6. Move head up in air to go in that direction
7. Back end seems to curl up when moving
8. Head is white
9. Head pops in and out
10. Have a black ring near anus
11. Tan and kind of pinkish color
12. Have white rings - where?
13. Tan spot on underbelly
14. Move one spot and not the whole body
15. Two ends can move in two different directions

Nice Observations !! Good Details!

Interesting!

Worm Questions

While you are observing the worms, record any questions you have about the worms.

16. How can it retract its body?
17. How good can it see?
18.
19.
20.

Can you think of any other questions? Ask your partner!

110

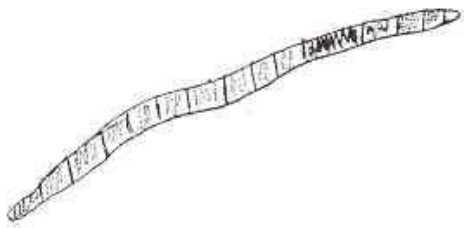
2/1/02

Worm Observation Lab

Next time, please use pencil.

Worm Portrait

(Draw a detailed picture of your worm)



Where's the mouth?

INVESTIGATE:

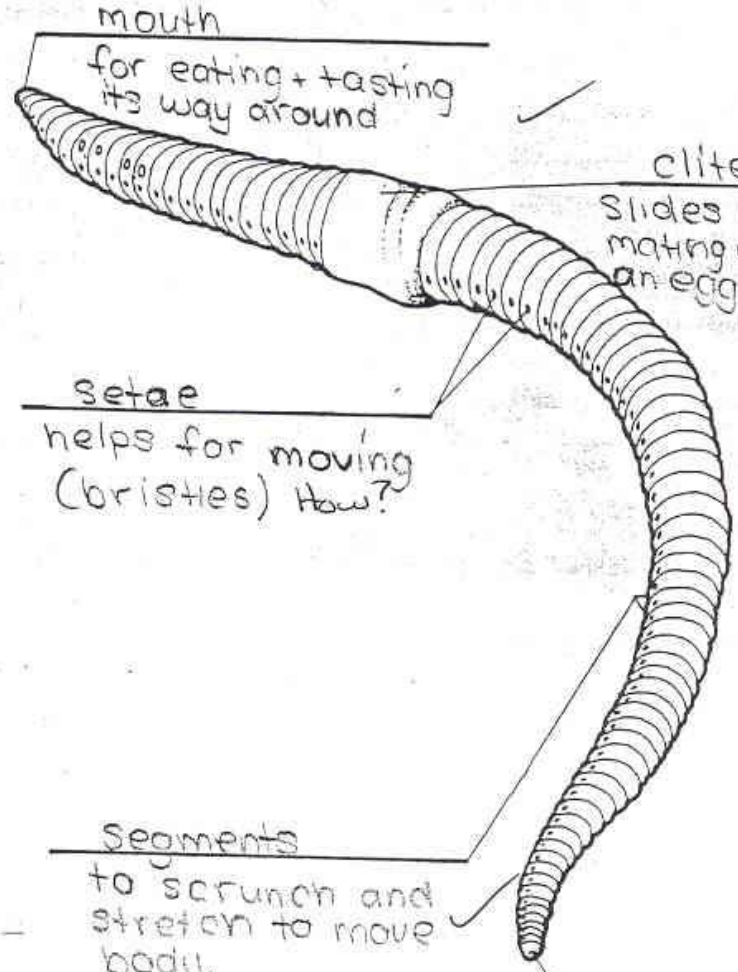
1. Can you tell which is the front end of a worm and which is its tail? Is there a difference? How can you tell?
   Yes, there is a difference and I can tell because the head has a white spot and the tail is darker. What was the other way discussed in class?
2. How do worms move? Explain in detail. Do they ever move backwards?
   They seem to wriggle or curl their bodies in order to move. Yes they can and do move backwards. What are they doing with their segments?
3. What happens when a worm meets another worm?
   The worms curled together to keep their slime skin sticky. ← Why is this important?
4. Can you find and do you think the worm has:
   a. Ears? No Why? Because it does move when I yell
   b. Eyes? No Why? Because it doesn't react when I come close
   c. Mouth? Yes Why? So it can eat and it poops ← not through to it. Its mouth
   d. Nose? No Why? Because it does not smell ← How do you know?
5. How is the worm like you?
   The worm is like me by it moves around alot We both have ~~eyes~~ and a mouth. Can you think of anything else? You just wrote that worms don't have eyes!
6. How is the worm different from you?
   The worm is different because it lives in the ground and is slimy. Can you think of anything else?

The Earthworm Student #1

Name Student #1

2/4/02

Label the exterior parts of the earthworm.



mouth
for eating + tasting its way around

clitellum
Slides off after mating and becomes an egg sack

Setae
helps for moving (bristles) How?

Segments
to scrunch and stretch to move body.

anus
after digesting, casting come out of anus.

WORD BANK

~~mouth~~ ~~clitellum~~ ~~setae~~
~~segment~~ ~~anus~~

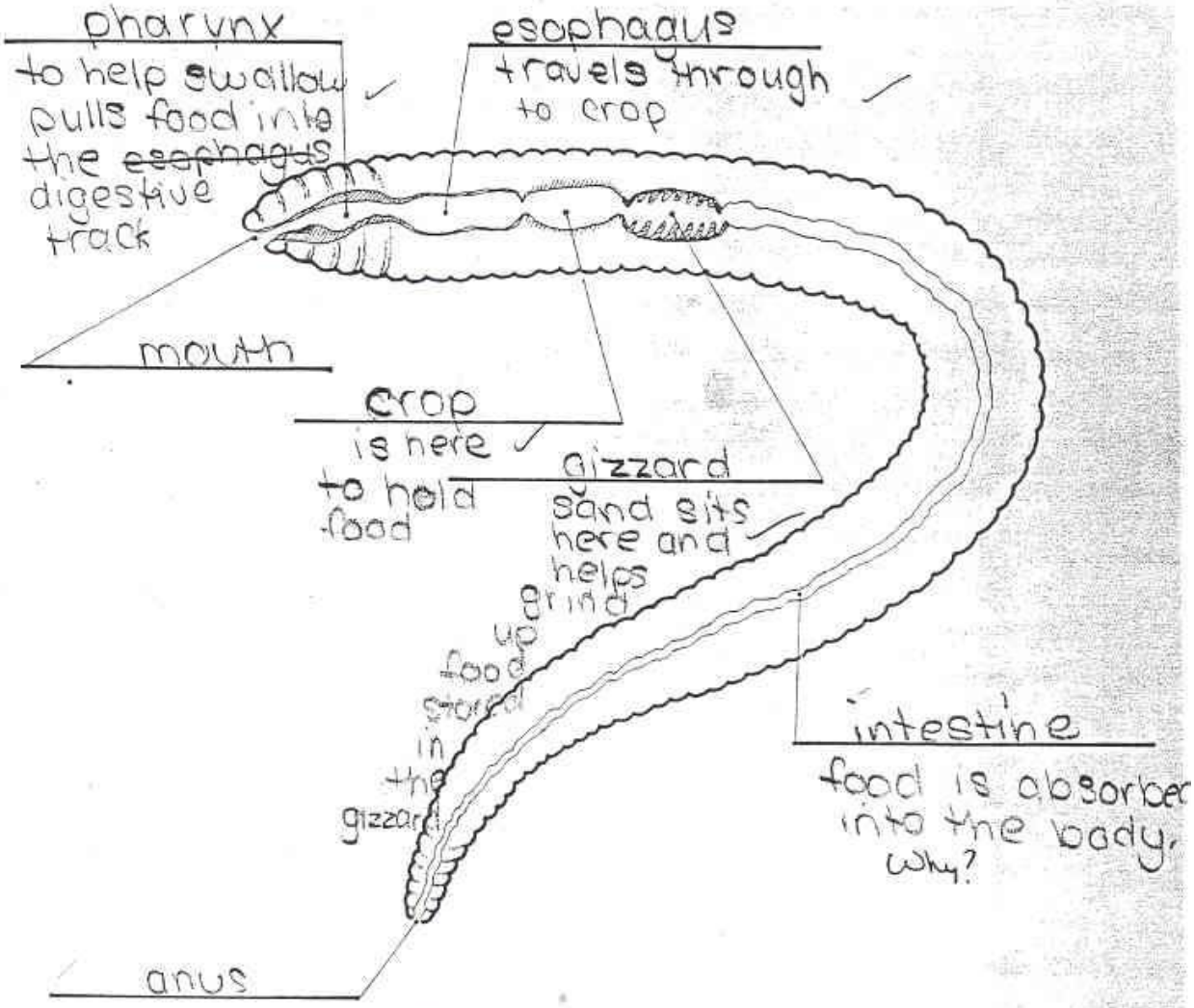
The Earthworm – Digestive System

Name Student #1

2/4/02

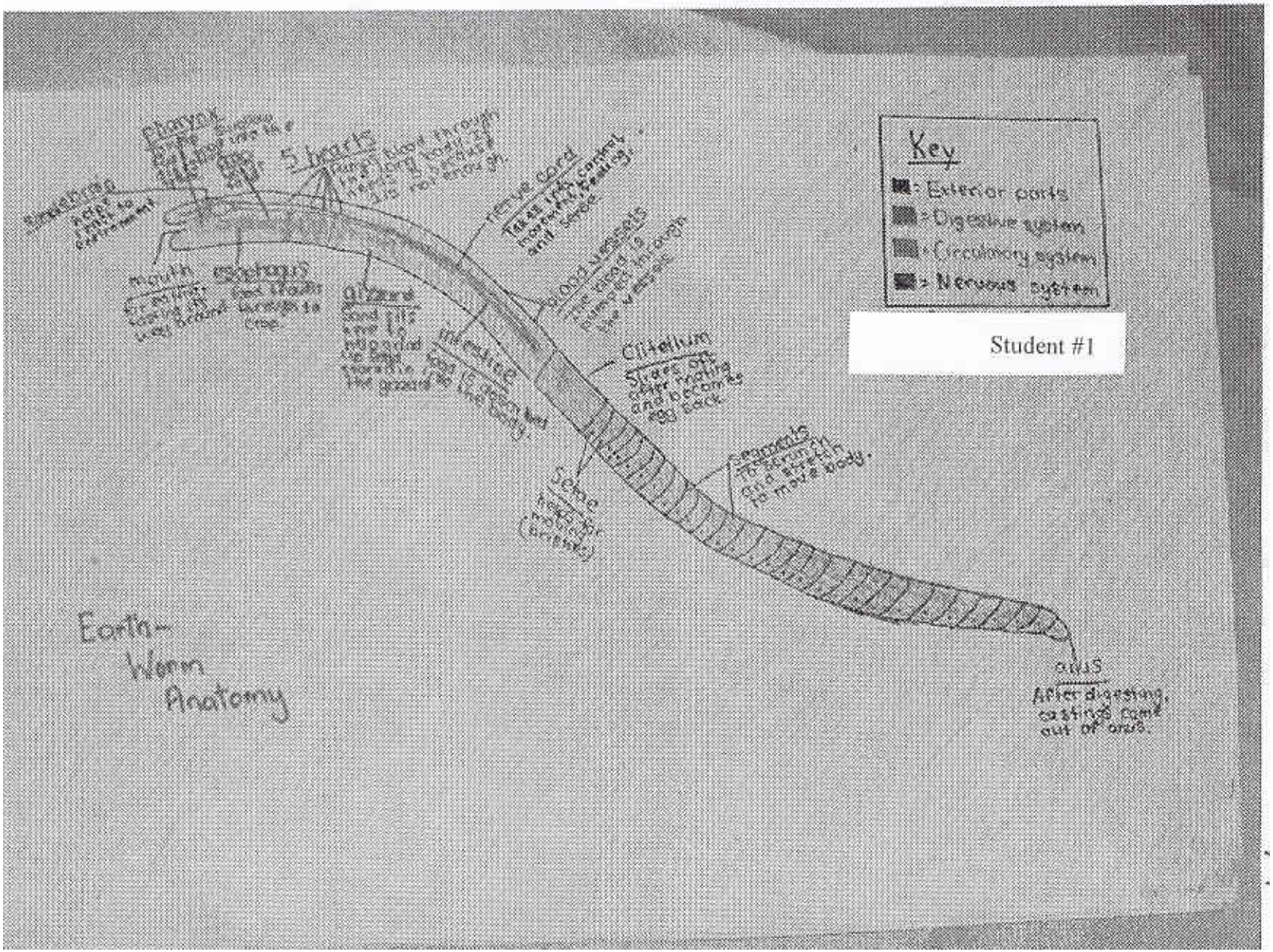
For the earthworm, as with most animals, digestion takes place in a long tube with openings at both ends. This tube is divided into organs that do different jobs.

Label the parts of the earthworm's digestive system.



WORD BANK

~~crop~~ ~~intestine~~ ~~esophagus~~
~~mouth~~ ~~gizzard~~ ~~anus~~
~~pharynx~~


Key
= Exterior parts
= Digestive system
= Circulatory system
= Nervous system
Student #1
Earth-
Worm
Anatomy
5 hearts
nerve cord
Clitellum
anus
After digesting, castings come out of anus.

Student #1

Worm Poster Grading Rubric 2/5/02

The objective of this project was to illustrate, label, and explain the anatomy of the earthworm.

Title (2 points) **Points Awarded: 2**

0 points: no title stated
1 point: unclear title stated
2 points: title clearly stated

Illustration (6 points) **Points Awarded: 6**

0 points: did not illustrate the internal anatomy of the earthworm
2 points: incomplete or unclear illustration of the anatomy of the earthworm Very Neat
4 points: generally clear and complete illustration with a minor error or omission & Easy to See!
6 points: clear and complete illustration of the anatomy of the earthworm

Labels (6 points) **Points Awarded: 6**

0 points: no labels of anatomy indicated
2 points: labels of anatomy are incomplete, disorganized, and/or hard to read
4 points: labels of anatomy are generally clear and complete with a minor error or omission
6 points: labels of anatomy are clear and complete

Explanation (6 points) **Points Awarded: 6**

0 points: no explanations of anatomy indicated
2 points: explanations of anatomy are incomplete, unclear, and/or disorganized
4 points: explanations of anatomy are generally correct and clearly written with a minor error
6 points: explanations of anatomy are accurate, well organized, and clearly written

Format (5 points) **Points Awarded: 5**

Gave yourself credit
Colored
Neat
Organized
Extra Effort
0 points: no
1 point: yes

Overall Points Awarded: 25 out of 25 points

Grade: A+ Excellent work! It was a good idea to color-code the anatomy and labels to make it easy to read.!! :)

Are Earthworms the Solution?

Erica
2/5/02

The Student Council has been given a small grant to start a recycling program in the cafeteria. They realized that a tremendous amount of food is thrown away each day. The Student Council heard that vermicomposting might be a possible solution to the problem. They do not have much information on this topic; therefore they are asking our class to research the topic because we are already studying earthworms. As a class, your mission today is to determine whether or not vermicomposting is beneficial for our school. What do you think would be positive, negative, or interesting about this type of recycling program? Organize your information below.

+ (good)	− (Bad)	I (interesting)
• Can recycle unused garbage • Saves money • Good for environment • Enhance garden compost • Castings full of protein • Worms multiply • Make air ways for air to get to the roots. • non-wax paper and cardboard can be composted	• some things cannot be composted • kids might make mistakes and throw bad foods in the pile that cannt be composted • some people don't want garbage in their backyard ← what does that mean to us? • they will have to watch the worms • it will be cold because it is a pile of garbage ← why?	• That worms can actually do this. • Worms can multip • enough worms to move 40 tons of soil per acre every year • Red wrigglers are the best • Vermes means worms

I know that you were taking the notes for the class on the board, but can you elaborate or add to the ideas on this paper?

Name: Student #1 student #1

Worm Experiment 1

Question: Do worms prefer damp or dry?

Hypothesis: I predict the worm(s) will choose damp.

Experiment Directions:

1. Cover one half of your worm tray with a damp paper towel.
2. Cover the other half with a dry paper towel.
3. Place your worm in the center of the paper towel: one end on the damp, one end on the dry.
4. Watch your worm for 3 minutes. Record where the worm is located each minute, damp or dry. Repeat 2 more times.

Observations:

Trial Number	Minute 1	Minute 2	Minute3
Trial 1	Damp	Damp	Damp
Trial 2	Damp	Damp	Damp
Trial 3	Damp	Damp	Damp

Results: How many times did the worm choose: damp 9 dry 0

Conclusion: This worm prefers: damp ✓ dry____

Why do you think this happened?

This happened because worms live in damp soil and their skin needs to stay wet/damp since they breathe through their skin. Their skin is what helps them move around. What will happen if it dries?

Name: Student #1 Student #1

Worm Experiment 2

Question: Do worms prefer light or dark?

Hypothesis: I predict worms prefer dark.

Materials: (How many?) Worms, stopwatch, black piece of paper, containe (tin) moist paper towel

Experiment Directions:

1. Put a damp paper towel in the tin.
2. Cover half the tin with the black piece of paper. Good!
3. Put the worms in the center: one end in dark and one in light.
4. Watch worm for 3 minutes. "Don't forget: Record where the worm is located after each minute." Record and repeat 2 more times.

Observations:

Trial Number	Minute 1	Minute 2	Minute3
Trial 1	dark	light	dark
Trial 2	dark	dark	dark
Trial 3	dark	dark	dark

Results: 8 dark 1 light

Conclusion: My worm seemed to like dark better.

Why do you think this happened? Nice

This happened because worms live in the dark (soil) and they might think the light is the sun which would suffocate them, because worms breathe through their skin and their skin is what helps them move

120

Worm Experiment 3

Question: Do worms like a warm or cool environment?

Hypothesis: I predict my worm will like a cool environment.

Materials: 2 worms, timer, tin, cold ice pack, hot towel, and 1 moist paper towel.

Experiment Directions:

1.) Place a damp paper towel in tin.
2.) Put the hot towel on half of the tin (underside) and put the ice pack on the other half.
3.) Nicely place your worms in the middle so one half of the worms are on the warm side and one half is on the other side.
4.) Watch your worms for 3 minutes. Record the side the worm is on each minute. Repeat 2 more times.

Observations:

Trial Number	Minute 1	Minute 2	Minute 3
Trial 1	Cool	Cool	Cool
Trial 2	Cool	Cool	Cool
Trial 3	Cool	Cool	Cool

Results: 9 cool 0 warm 0 room temperature

Conclusion: My results are the worms choose cool 9 times over warm and room temperature. Yet the class results

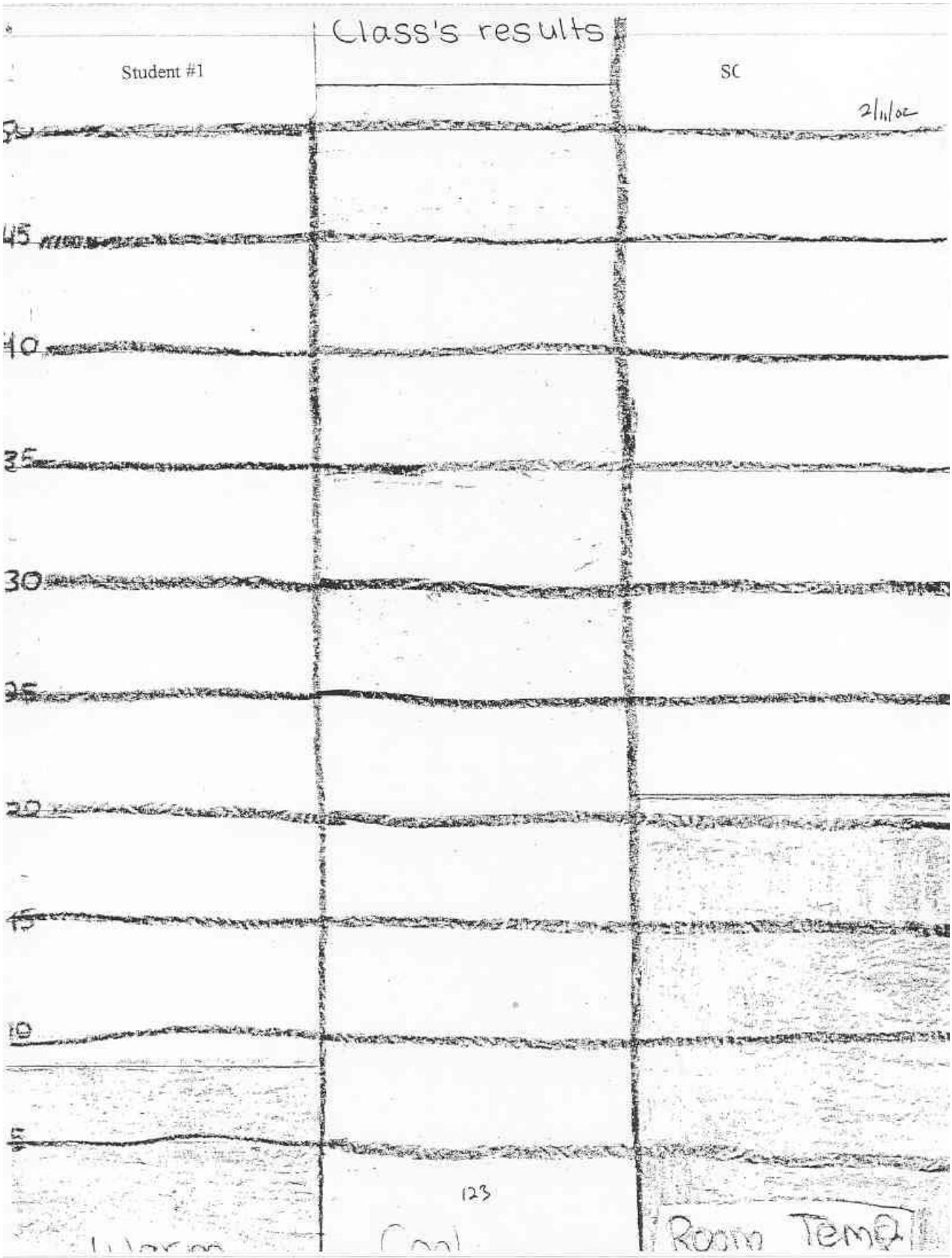
|2|

were 8 warm, 52 cool, and 21between temperatures. I think the experiment was accurate and the bin should be placed in a cool place maybe under something. There should be a lid on top of the bin.

The first experiment we did was to see if the worms liked damp or dry. The worm chose damp every time in my group because worms breathe through their skin and if they dry out they could not breathe or move since their skin is what helps them move too. It was accurate because the worms could feel their choices and pick which one they preferred because inside the bin it needs to be damp.

The second experiment was to see if the worms liked light or dark. The worms chose dark more times than they chose light because worms live in dark soil and they might think the light is the sun, which would suffocate them. The worms had equal chances to choose either dark or light. From this experiment, the bin needs to be drilled all around including the lid. What do you mean?

The third experiment we did was to see if the worms preferred a cool or warm environment. The worms chose cool because the soil they live in is cool and the worms would not want to dry up and suffocate from the hot dry sun. Again, the worms had equal chances and chose a cool environment.


Class's results
Student #1
SC
2/11/02
45
40
35
30
25
20
15
10
5
123
Cool
Room Temp

Student #1

Worm Experiment #3 Grading Rubric

The objective of this experiment was to determine the environmental conditions for vermicomposting.

Question (1 point) **Points Awarded:** 1

0 points: no question stated
1 point: question stated

Hypothesis (1 point) **Points Awarded:** 1

0 points: did not answer question
1 point: answered question

Material (3 points) **Points Awarded:** 3

0 points: did not list materials
1 point: incomplete list of materials
2 points: complete list of materials with no quantities indicated
3 points: complete list of materials with quantities indicated

Directions (6 points) **Points Awarded:** 5

0 points: no directions indicated
2 points: directions are incomplete and disorganized
4 points: directions are generally clear and complete with a minor error or omission
6 points: directions are clear and complete Step #2 needs more clarification.

Data (3 points) **Points Awarded:** 3

0 points: no data reported
1 point: no data table, or the data table is incomplete and disorganized
2 points: data table is generally correct and clearly labeled with a minor error or omission
3 points: data table is well organized and clearly labeled

Results (2 points) **Points Awarded:** 1 +1 Nice graph, but you need to label y axis

0 points: did not include results
1 point: included your own results
2 points: included your own and class results
(Extra point for graphing class or own results)

Conclusion (6 points) **Points Awarded:** 5

A little difficult to follow.

0 points: no conclusion reported
2 point: conclusions are not supported by the experimental data and results, are unclear, disorganized, or illogical
4 points: conclusions are generally clearly stated and supported by experimental data and results, except for a minor error or omission.
6 points: conclusions are clearly stated and supported by the experimental data and results

Format (3 points) **Points Awarded:** 3

Experiment was typed
Organized Lab Format
No larger than 14 pt font
0 points: no
1 point: yes

Overall Points Awarded: 23 out of 25 points

Grade: A-

124

Student # 1

Best Environment for Worm Bins 2/11/02

Experimentation & Research Results:

- Worms like damp soil. ← Are we going to start off with soil?
- Worms prefer dark. ✓
- Worms do come out at night ← How is this useful info?
- The worm bin needs holes so air can get in. Why?
- Need sand so worms can digest food ✓
- Red wrigglers are the best kind. ✓
- Worms can live in temperatures ranging from 85°f-90°f. ← Didn't our research claim worms prefer cool temps? Maybe we need to do more research on this?
- Raise bin for drainage Why? ~~and~~ make holes in
- Plastic bin is best why?
- Add / mist water
- Need to add newspaper / ~~top soil~~ How should it be prepared?
- Newspaper gives air space, helps them breathe, and get to their food

(+) Missing some info! In the future, please add to your notes during the discussion. ✓

· What are you going to feed the worms? How much?

Student Council
468 South Avenue

Dear Student Council:

Hi, I am and I believe it would be an excellent idea to start vermicomposting in our school. Vermicomposting is a great way to help save our earth by not making so much garbage. I know a lot about vermicomposting because in my workshop class we are learning about worms and their fabulous way of eliminating waste. Do you realize how important composting is?

It is important to recycle food waste because food waste builds up garbage. If there were less to throw out, dumps would not be so crowded with garbage. Plus polluting and too much waste is not good for our earth. By having less food waste we are not making as much garbage as we could if we didn't recycle. To help the earth, the composting needs to start someplace, so why not begin in our school?

Our school contains over a 1000 of kids, including staff. Each lunch period 5 or 6 bags of leftover food is thrown away. There are 4 different lunch periods and each lunch period approximately 6 bags are filled with garbage. You do the math; that is 24 big bags of garbage a day. Now that is a lot!! Vermicomposting would start to reduce food waste, providing the school less to throw out since 1 pound of worms can recycle a half a pound a garbage a day.

Composting would also help the community too. It would again reduce waste yet enhance gardens and or improve the soil in . The soil that is produced by the worms, is the food that has been thrown out. s only one dump and over thousands of residents that produce garbage. Even though a small percentage of people do composting, some recycling is better than none. In order to compost, you need to know how to start.

Composting is actually a fairly simple procedure. First you need 2 plastic bins with a lid, newspaper, sand, food waste, and one or more pounds of worms. The best worms are the Red Wrigglers. Then you need to drill holes in the lid and the bottom of one bin. The holes in the lid are for air and the holes in the bottom are for drainage so the worms don't have too much water. You need to shred the newspaper and dampen it, so the worms don't dry out. Shredded newspaper is easier for the worms to move through in order to get to the food. The sand is digested into the gizzard to help grind up food. Then you need to add your food waste. No bones, diary products, or plastics can be composted.

Vermicomposting is a great way to reduce food waste, help the earth, and is very inexpensive. Be assured that the compost will not eminent odors if you do not put on an over abundance of waste. I am telling you it is in your best interest to support

vermicomposting in our school. Think about it. What is the worst it could do? Thank you for your consideration.

Sincerely,

Student #1

Student Council Letter Grading Rubric 3/14/02

The objective of this letter was to persuade the student council to consider (or not) vermicomposting in the cafeteria.

Introduction Paragraph (6 points)

Total Points Awarded: 6

Grabbed the readers interest	0	1	(2)
Included your position on vermicomposting	0	1	(2)
Established credibility to your reader	0	1	(2)

0 points: Did not include information
1 point: Included the information, but weak
2 points: Included the information and met expectation

Body Paragraphs (12 points)

Total Points Awarded: 11

Why is it important (or not) to recycle food waste?	0	1	(2)
What worms are the best composters? How began know which are the best?	0	(1)	2
How can vermicomposting help (or not help) the school?	0	1	(2)
How can vermicomposting help (or not help) the community?	0	1	(2)
What are your recommendations for making a worm bin?	0	1	(2)
Organized your information in the best order that made sense	0	1	(2)

0 points: did not answer the question
1 point: partially answered the question
2 points: sighted specific evidence and examples from research that answered the question that helped prove or illustrate your purpose or main idea.

Conclusion Paragraph (4 points)

Total Points Awarded: 4

0 points: no conclusions made
1 point: conclusion did not support original position
2 points: conclusion weakly supported the original position
3 points: conclusion supported the original position without much persuasion
4 points: conclusion was highly persuasive and supported the original position

Format (3 points)

Total Points Awarded: 3

Letter was typed	0	1
Business Letter Format	0	1
No larger than 14 pt font	0	1

0 points: no
1 point: yes

Overall Points Awarded: 24 out of 25 points

Grade: A Wonderful letter! You've spent a lot of time thinking about the subject!

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Name: Student #1 Date: 2/13/02 Period: 9

Student #1

43/50 86%

Earthworm Quiz

1. Draw and explain how an earthworm is adapted to moving underground. 4 points -1 -1.5

The worms have setae that help them move along. How? -.5
Also, their segments scrunch and stretch to help them move.

2. Compare how an earthworm senses its environment with how you sense your environment. 10 points

An earthworm tastes it environment with its mouth and The worm can see by cells that only detect light and dark. It hears by vibrations and smell by using other cells in its body. The earthworms touch and feels the ground using its head and body skin. Their brain operates & takes in the info. I see my environment with my eyes, touch by my skin/hands, taste with my mouth, and hear with my ears. The worms see differently, feel dirrently, and hear differently than me. Also taste and smell is different Explain We taste with our mouth -1

3. Would you recommend earthworms for a garden? Compare how a garden would be with and without earthworms. 9 points -1

Yes, I would because the worm's castings are very good for the soil since they contain alot of nutrients. The worms eat up the dead plant and animal matter. Also, the worms create air passageways, so the roots can grow and breathe. A garden without worm would not be so nutrental, the roots might not grow as quickly, plus the soil might contain not so good things for the plant What would the plants look like? -1 ↑ What do you mean by this?

Student #1

4. Do you think vermicomposting is important? Why is it used? 9 points -1

Vermicomposting is important because it saves time and space for building dumps and the garbage that is already contained in the dump. Composting also reduces food waste that is transported to the dump. Less garbage is good for the earth. It is used to reduce food waste and to help the earth. Composting is cheap and doesn't require alot of space.

What can you do with vermicomposted material? -1

5. How would you create a worm bin? Explain why each component is important. 15 points -2

1. Get 2 bins, one for the worms and one for drainage
2. Drill holes in the lid for air and holes in the bottom for drainage. Don't want too much water - why? -.5
3. Shred + dampen newspaper so worms don't dry up and can get to the food easier, and? -.5
4. Add sand, so the worm eats the sand that goes to the gizzard which grinds up food. How much? A lot? A little? -.5
5. Add the worms, red wrigglers are the best.
6. Put the food in so the worm can digest it. ↑ What kind? -.5

6. Assess why some worms in the class worm bin are lacking their clitellum. Predict what is going to happen to the population of worms in the bin. 3 points

What did they become?

The worms are missing their clitellum have mated and the population of the worms are going to increase. Yeah!!

Punk worms

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Commentary Evaluating Students' Learning

Explain how you and your students used the evaluation criteria and performance expectations for the lab and STS to assess the quality of student learning on each of these two assignments.
Student #1 and I used the evaluation criteria to enhance ideas. Showing knowledge of the subject, Student #1 learned that there needed to be a little more attention to detail. Overall, Student #1's evaluations and expectations for both the lab and the student council letter (STS) showed that expectations were met.

Student #2 and I used the evaluations for the lab and STS in different ways. The lab evaluation with student #1 showed that there needs to be a little more attention to detail when writing up a lab. In the future, I will have to stress the importance of small details. Student #2 met my expectations for the lab. On the other hand, student #2 had a great deal of difficulty with the student council letter (STS). I thought I provided a clear set of directions, but somehow the conclusion was omitted. If there was time, the student would have the chance to redo the assignment paying closer attention to details and directions. In the future, I think I need to pay closer attention to reviewing directions with the class. Somehow I need to make it a little more interactive to keep the students following along so they do not miss any critical directions.

What are the strengths and weaknesses in each student's understanding of science process skills, as evident from the work on the lab?
I think Student #1 is developing an understanding for science process skills. Shown on the worm observation sheet, Student #I is good at making basic observations with some detail, yet shows difficulty with thinking of new questions during observation. Student #1 also demonstrated some difficulty answering basic questions through observation with and without guidance. On the Worm *Observation Lab* sheet, Student #1 had difficulty correcting work because errors were not fixed or details were not added during the class discussion. Student #1 did reveal a good ability with researching and discussing a topic. Carrying out an experiment and making conclusions with data also proved to be a strength. The individual was able to draw conclusions from the results of one's own experiment along with the results of the class. Student #1 was able to apply the knowledge from the three experiments to explain how the worm bin environment should be created.
Student #2 had much more difficulty with making observations and thinking of questions from observations. Student #2's *Wonderful Worm Observation* sheet was incomplete, and I am sure the student had more than enough time to complete that page. There was also difficulty backing up

answers with observations, as illustrated on the *Worm Observation Lab* sheet. Again, the student did not correct or add detail during the class discussion. This makes me think that I needed to stress to the students the importance to writing about their learning. On the other hand, Student #2 demonstrated aptitude for designing and carrying out an experiment with a little difficulty drawing conclusions. Student #2 did not discuss the class results of the experiment in the conclusion. Again, detail and a little more organization would have helped this student.

What are the strengths and weaknesses in each student's understanding of how to apply science knowledge to make decisions about science, technology, and society issues, as evident from the work on the STS?

Writing the letter to student council, Student #1 was able to demonstrate that the processes of science were critical to forming a valid opinion about vermi-composting. Student #1 was able to mix Internet research and experimental research to persuade student council to consider vermi-composting. Student #1 was the leader of the class discussion for the STS, which exemplified her knowledge of being able to discuss the topic.

Researching for Student #2 proved to be a bit more of a challenge. Participating in class discussions also seemed to be a weakness, as noticed while I was watching the video. Much of the information on the "Are *Earthworms the Solution?"* and "*Best Environment for Worm Bins"* sheets was added during the class discussion when the notes were on the board.

Reviewing the student council letter, Student #2 displayed a little more difficulty with supporting ideas with research. Student #2 struggled with establishing credibility for research. A few of the conclusions about vermi-composting, from the Internet research, were a little shallow when it needed to be applied to how it could help the school and community. I think Student #2's lack of enthusiasm for the subject made thinking and writing for this STS an arduous task.

What are the strengths and weaknesses in each student's understanding of the unit's science concepts, as evident from the work on the unit's assessment?

Overall, Student #1 showed a good understanding for the science concepts. Except for a few small details, Student #1 learned a lot about earthworms and their importance. I am pretty sure Student #1 did not draw the earthworm on the quiz because the student did not read the question carefully, not because the student could not draw adaptations. Comparing appeared to be a strength. Student #1 was able to first describe the senses of the earthworm than describe one self s senses. It seems evident

that there was a little trouble with cause and effect relationships. Student #1 had difficulty with thinking about what a plant might look like or be like if it was not effected by earthworms. Also, after making vermi-composted material, Student #1 had some trouble explaining what to do with the material.

Student #1 showed good knowledge for writing the steps of creating a worm bin, yet needed to pay closer attention to detail. Making educated predictions appeared to be a strength. When asked, "What will happen to the population of earthworms, if many of them lack their clitella?" Student #1 was able to accurately respond that the population was going to increase.

Student #2 struggled a bit more with the unit's assessment. She was able to draw but had some difficulty adding detail to explain how earthworms are adapted to moving underground. Comparing oneself to an earthworm appeared to be a simple task for this individual, discussing each sense and how it was similar or different within the same sentence. Again, detail was the weakness. When asked to compare how a garden would be with and without earthworms, Student #2 had difficulty being specific about how a garden would be without earthworms. This individual displayed a solid understanding of the benefits of earthworms in a garden. Justifying an opinion with researched facts was a weakness for Student #2. It was difficult for student #2 to justify the importance of vermi-composting with specific facts. A major fact not discussed in the answer was what waste can be used for vermi-composting to be successful. Writing directions for creating a worm bin also lacked important details. Again, this individual was not thorough about exactly what earthworms eat.

Finally, making an educated prediction with given information proved to be a strength. Student #2 also predicted that the earthworm population was going to increase with the lack of clitella on many worms in the bin.

Reflection on Teaching and Learning

What did you learn about science learning of the entire class during the unit? Use performance patterns identified in the submitted student work to illustrate specific points in your analysis.

At this age I noticed that modeling my expectations guided the students in their learning. Prior to each activity I had to give students examples of how I expected the work to be done. This gave them the structure they needed to promote their own learning. They are not independent enough to devise their own structure; therefore, there is a need for some guidance and reminders. For example, during the first experiment, I gave them a sheet with all of the directions on it. It was very guided. The next day I took some of the scaffolding away and gave the students a sheet with order of the scientific method and had them fill in the blank spaces. The last day of experimentation they were able to develop and carry out their own experiment.

The greatest thing I learned was that my students learn more from discussion for a variety of reasons. First, the discussions clarified many of their ideas. Many of the students came into a discussion being very focused on one idea. When they heard ideas of other students, they were more apt to be able to support or reject their original thought. This was evident during the discussion of the STS research when the students went from thinking vermi-composting was a negative plan to their thinking it was a more positive approach.

Discussions also helped clarify their learning about the topic. At the start of the unit after observing the worms and answering questions, the students still had some misconceptions about earthworms. During the discussion they were corrected. For example, prior to the discussion, many of the students thought the worms had eyes because it looked like the worms were looking at something when they were picking up their heads. The discussion clarified that worms lack eyes and can only sense light and dark, which was an important concept during other lab activities.

The last important observation I made about their learning is that the students struggle with attending to details and correcting their work. In the future I need to spend more time encouraging them to correct and add detail to their work. For example, on the Worm Observation Lab sheet many of the students did not extend their answers after being discussed in class. When I was reviewing the sheet with the class, it appeared that they were correcting their work, but I guess I was wrong.

How did your unit design and instructional strategies support students,' abilities to search for, gather and analyze information from different sources?

During this unit the students used observation, models, experimentation and reading to gather and analyze information. I tried to make the unit as hands on and inquiry based as possible. From the very beginning I wanted the students to feel responsible for their learning. I spent time letting them think of questions they had about worms and observe worms to answer many of those questions. I had them compare worm anatomy to their own so it would make a lot more sense.

I attempted to make this unit somehow apply to the students. Sixth graders are still egocentric about their learning. Instead of just telling the students to research vermi-composting, I made it a student council issue. This empowered the students. They thought there was an important reason for their research, not just to do what the teacher asked.

During that STS research they had a lot of reading material to scan through and find important information. Instead having the students work independently, they worked in groups of four to limit the amount of reading each student had to do. As the students were researching they were discussing and writing their ideas with the small group. This also helped the students that had difficulty with reading for important information.

The discussion of that activity helped the students analyze the information they had gained. They were able to take the information from the research and apply it to how vermi-composting would be positive for the school and community.

Having the students participate in the three experiments to discover the best conditions necessary for a worm bin was also motivating for the students. They had to learn the structure of the scientific method and carry out an experiment. Through the small group discussion, during the experiment, and the large group discussions after each experiment helped the students analyze their data and draw conclusions that would impact the formation of the worm bin.

How can you improve the instructional design and implementation of this unit for a similar group of students in the future? Please be specific and support your ideas with relevant evidence from your portfolio.

There are a few parts to this unit that I want to change when I teach this unit again. The first piece that had trouble fitting the unit was the worm anatomy piece. I don't think it was all that important discussing and explaining the anatomy of the entire worm. There were some critical organs they needed to know about and I should have just focused on those pieces. For example, it was important for the students to know how worms grind their food in the gizzard because sand was needed to be add to the vermi-composting bin. Without that knowledge the students would not know why the sand was added to the bin, and during the final assessment would forget that sand was

needed to create a worm bin. I would also skip the anatomy project and somehow include the important anatomy pieces in an additional more inquiry based lab activity.

For the STS research I would like to provide them with additional resources rather than just relying on the Internet for information. The students found that the Internet information often contradicted itself. I think providing books on the subject and also a video may have helped the students true understanding of vermi-composting. I could tell they had a lot of difficulty realizing the need for recycling programs. In the future I need to explore more activities about recycling in general. These students have not had any experience with this topic because it is not practiced in the school.

I also feel that I left out other important information about vermi-composting like exactly how many worms it would take and how big a bin would be needed to realistically work in the school cafeteria. Another component that needs to be added to this unit is that the red wigglers are not the only living creature in the bins. Many microorganisms move in and aid in the decomposition process.

Another piece I need to change is that I need to show the students how to graph their results and interpret data by using those graphs. In this unit the experimental data can easily be displayed on a graph. Therefore, I need to teach and encourage the process from the very first experiment.

Lastly, I need to find ways to make the classroom discussions much more animated. I need to have the students play a much more physically active role in those discussions to keep them awake and inspired.